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THE BOSTON
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A MANUAL
OF
MATERIA MEDICA
AND
PHARMACOLOGY.

COMPRISING ALL

ORGANIC AND INORGANIC DRUGS WHICH ARE AND HAVE BEEN
OFFICIAL IN THE UNITED STATES PHARMACOPŒIA,

TOGETHER WITH

IMPORTANT ALLIED SPECIES AND USEFUL SYNTHETICS,

ESPECIALLY DESIGNED FOR STUDENTS OF PHARMACY AND MEDICINE, AS WELL AS
FOR DRUGGISTS, PHARMACISTS, AND PHYSICIANS.

BY

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THE UNIVERSITY OF MARYLAND MEDICAL AND DENTAL SCHOOLS.

SECOND EDITION, ENLARGED AND THOROUGHLY REVISED.

With Four Hundred and Sixty-four Illustrations.

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PREFACE TO THE SECOND EDITION.

IN this revision the endeavor has been to correct not merely minor errors that are inseparable from a first edition, but to bring the entire contents up to current date. While these two conditions may not have been absolutely fulfilled, yet it is truly believed that the work as now presented savors more of completeness than in its original form. The interest of students, both in pharmacy and medicine, has been carefully studied, and only such additions and changes introduced as it was thought would appeal most to their wants.

The general scope remains approximately the same, and the basal plan, although apparently somewhat departed from, has in reality been adhered to all the more closely: *to associate as nearly together as possible those substances, organic and inorganic, which have a common or allied origin, allowing those next related to follow in regular order, the basal or parental source thus being kept paramount.* That this might be possible, the systematic arrangement of vegetable drugs has been shaped after Engler and Prantl, in their "Die Natürlichen Pflanzenfamilien," modified, however, occasionally to bring it into nearer conformity with that of Britton and Brown's "Illustrated Flora."

Although such a step would seem to imply at least partial inversion of the order of sequence formerly followed (that of Bentham and Hooker's "Genera Plantarum"), it equally means that we are thereby taking the initiative in America, in making such an application restrictive to drugs, yet the acceptance of the new system and the discarding of the old has been considered wise from several standpoints, but mainly because that which is of recent origin and appears more in harmony with *nature and her laws* should be promulgated as early and widely as possible; for indeed scarce any one doubts that Nature's order of development has been a gradual process of evolution from the simple to the complex, and not the converse.

This adoption must needs carry with it the more modern and reformed plant nomenclature, which unfortunately, in some instances, is at variance with that of our present (1890) Pharmacopœia; the accompanying parenthetical citation, however, of this latter synonymy, underneath and parallel with the former, is hoped to be self-explanatory, and to prevent any possible confusion.

Animal drugs, as formerly, are considered in the order of natural historic relationship of the animals from which obtained; *i. e.*, the zoölogic sequence, but here have been adjusted so as to be in conformity with the same great principle of evolution—to begin with the lowest and grade up to those of higher development.

Inorganic drugs, carbon and synthetic compounds still retain their original arrangement, their chemical relationship being always borne in mind.

Measurements are expressed in the Metric system, with approximate side equivalents in the English, and temperature is stated in both Centigrade and Fahrenheit scales, thereby giving to each an equal opportunity for use, according to individual pleasure and preference.

Doses are given in the Apothecaries' and Metric systems, in the hope that their parallel equivalents being thus easily compared, may possibly result in affording a stronger mind impression, and thereby become an element towards metric education.

These, together with the additions of many newer remedies a more detailed account of the physiological action of leading drugs their incompatibilities and synergists, a more comprehensive account of poisons, including combating methods, a treatise on prescription writing and a number of new illustrations, mark the leading changes that are hoped to merit for the work an increase in popular favor.

The author is alike grateful for the many expressions of commendation, as well as for the few of condemnation, which the first edition received—indeed the former have stimulated an honest exertion towards improvement, while the latter have served to show actual weakness where strength was needed.

For timely suggestions and important corrections thanks are due Professors Goodman, Rusby, Piquett and Base, while to the publishers a sense of deep indebtedness is felt for their continued and untiring efforts towards maintaining for the work a high degree of excellence.

DAVID M. R. CULBRETH.

BALTIMORE, November, 1900.

PREFACE TO THE FIRST EDITION.

THE author recognizes clearly that there already exist a number of valuable works on materia medica, the writers of which have expended time, labor, and originality in their production. It may, therefore, with reason be asked, Why introduce yet another to our profession? If there were not a fancied missing link, or had there been at command a single book on this subject thoroughly adapted, according to the author's opinion, to modern class instruction in colleges of pharmacy, this one would never have been undertaken and completed.

Its conception emanated from the drug-store, where for the past twenty years the imperative need of such a compend was frequently suggested to the writer by the daily routine demands of business, but its ultimate materialization was greatly promoted, in fact made possible, by the additional duties of a teacher assumed during the last ten years. Its scope has been made sufficiently comprehensive to prepare students for the constant needs of the modern drug business and to serve as a companion to the average pharmacist in his vocation. With this in view it has been made to treat of:

I. *All Official Drugs, Organic and Inorganic, included in our Pharmacopœia, together with Their Preparations, Official and Non-officiál.* Of each enough is said to interest and furnish general information, historic and otherwise, the endeavor being always made to stop short of incumbrance with details, though much of the purely syllabic form has been avoided after which many text-books are fashioned.

II. *All Drugs Once Official in Previous Editions of our Pharmacopœia, but now Dropped.* Although some of these are no longer professionally prescribed, yet many are retained in stores, and have a limited sale. Of such the pharmacist should have some knowledge, at least to the extent of description, properties, dose, and inclusive years of official recognition; since no similar text-book furnishes these combined data they have been concisely stated.

III. *Allied Species of Organic Drugs.* These frequently so resemble the official species as to furnish possible admixtures, adulterations, and dangerous substitutions; consequently, in order to identify the genuine, some of the spurious kinds most likely to be met with have been mentioned and briefly described.

IV. *Important Unofficial Synthetic Compounds.* These form a great factor in our current drug-store supplies and bid fair to grow in favor with both the public and the profession; while their number is very great, only the most useful have been considered.

The arrangement of the drugs themselves herein followed seems the most rational, inasmuch as it furnishes a more liberal knowledge and a better systematic comprehension of the subject in its entirety. This system can be formulated as being based upon the principle: *to associate as nearly together as possible those substances, organic and inorganic, which have a common or allied origin, allowing those related next in order to follow in regular sequence, the basal or parental source thus being kept in view.* Vegetable drugs are, therefore, arranged upon the classification of Bentham and Hooker in their *Genera Plantarum,* with a few interjected modifications to bring it into closer conformity with Gray's *Manual of Botany.* Animal drugs are also treated in the order of natural historic relationship of the animals from which obtained—*i. e.,* the zoölogic sequence, beginning with the highest and descending gradually to those of lower development. Inorganic drugs, carbon, and synthetic compounds have been similarly arranged, their chemical relationship, however, being kept in mind.

Doses have been given only in apothecaries' system. This is not intended in any way to disparage the metric system, but to the writer it seems desirable from the fact that the former is still universally used by druggists and physicians in this country. Side equivalents have been omitted to economize space and in the hope that all who may ever need a corresponding metric quantity will be sufficiently interested to make conversions by rule given on page 787 (842), and thereby become all the more familiar with its application and underlying principles.

Temperature has been expressed only in degrees of the Fahrenheit scale, because the latter is of such general use throughout our country as to place no one, be he scientific or otherwise, in doubt as to the approximate conception of intensity of any degree mentioned. It is also hoped, by avoiding side equivalents in Centigrade, that the student will learn thoroughly the rules of conversion on page 791 (848) and apply them at every opportunity.

Other characteristic features of the work deserving consideration are:

The etymology and pronunciation of the generic, specific, and ordinal names.

The English synonyms, also French and German names of each official drug, including its preparations.

The recapitulation tables, consisting of a summary of the official organic drugs so condensed as to be of considerable advantage in preparing for examinations.

The treatise on the microscope, also several tables, dose lists, abbreviations, etc.

The numerous cuts used to illustrate the text. These, if properly studied, will often serve to clear any ambiguity arising in the reader's mind. About one-half of them appear for the first time in an English work, and the remainder are mostly taken from original American and European sources.

In conclusion grateful acknowledgment is made for valuable assistance derived from the many works of other authors—for without these nothing tolerable and up to date can be compiled—and especially to Messrs. Lea Brothers & Co., who, in their endeavor to bring the work to the highest state of perfection, have spared neither labor nor expense.

BALTIMORE, June, 1896.

CONTENTS.

PAGE

Definition of Materia Medica and its subdivisions. 17–18
Forms in which medicines can be used 18–23
The avenues by and through which medicines enter the system . . . 23–25
The means by which medicines are transmitted through the system . . 25
Conditions which may modify the action, hence the dose of drugs . . 25–29
The classifications of medicines:
  1. Alphabetic Sequence 29
  2. Chemical Constituents 29–31
  3. Morphologic and Anatomic 31–32
  4. Therapeutic Effect 32–41
  5. Natural Affinities (Botanical) 41–50

PART I.

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM 51–583

THALLOPHYT(ES)-A—Algæ, Fungi, Lichenes 51–61
Gigartinaceæ, Red Seaweed Family—Chondrus 51–54
Hypocreaceæ, Flesh-consuming Family—Ergota 54–59
Parmeliaceæ, The Foliaceous-Lichens Family—Cetraria 59–61

PTERIDOPHYT(ES)-A—Filicinæ, Lycopodinæ 61–66
Polypodiaceæ, Fern Family—Aspidium 61–64
Lycopodiaceæ, Club-Moss Family—Lycopodium 64–66

SPERMATOPHYT(ES)-A—Gymnospermæ, Angiospermæ . . 66–583
Pinaceæ (Coniferæ), Pine Family, Conifers—Terebinthina, Terebinthina Canadensis, Pix Burgundica, Oleum Juniperi, Oleum Cadinum, Sabina. 66–78

Monocotyledones 78–133
Graminaceæ, Grass Family—Zea, Amylum, Saccharum, Triticum . . 78–89
Araceæ, Arum Family—Calamus 89–91
Melanthaceæ, Bunch-flower Family—Veratrum Viride, Veratrina . . 92–96
Liliaceæ, Lily Family—Allium, Scilla, Aloe Socotrina, Aloe Barbadensis . 97–107
Convallariaceæ, Lily-of-the-Valley Family—Convallaria, Colchici Radix, Colchici Semen 107–112
Smilaceæ, Smilax Family—Sarsaparilla 112–116
Iridaceæ, Iris Family—Iris, Crocus 117–121
Zingiberaceæ, Ginger Family—Cardamomum, Zingiber 121–129
Orchidaceæ, Orchid Family—Cypripedium, Vanilla 129–133

Dicotyledones 133–583
CHORIPETALÆ 133–429
Piperaceæ, Pepper Family—Cubeba, Piper, Matico 133–140

PAGE
Juglandaceæ, Walnut Family—Juglans 140–142
Salicaceæ, Willow Family—Salicinum 142–143
Betulaceæ, Birch Family—Oleum Betulæ Volatile 144–145
Fagaceæ (Cupuliferæ), Beech Family—Castanea, Quercus Alba, Galla . 145–155
Ulmaceæ, Elm Family—Ulmus 156–157
Moraceæ, Mulberry Family—Ficus, Humulus, Lupulinum, Cannabis Indica 157–164
Santalaceæ, Sandalwood Family—Oleum Santali 164–165
Aristolochiaceæ, Birthwort Family—Serpentaria 165–168
Polygonaceæ, Buckwheat Family—Rheum, Rumex 168–175
Chenopodiaceæ, Goosefoot Family—Chenopodium 175–177
Phytolaccaceæ, Pokeweed Family—Phytolaccæ Fructus, Phytolaccæ Radix 177–179
Magnoliaceæ, Magnolia Family—Illicium 179–182
Myristicaceæ, Nutmeg Family—Myristica, Macis 182–185
Ranunculaceæ, Crowfoot Family—Hydrastis, Cimicifuga, Staphisagria, Aconitum, Pulsatilla 185–199
Berberidaceæ, Barberry Family—Caulophyllum, Podophyllum . . 199–205
Menispermaceæ, Moonseed Family—Menispermum, Pareira, Calumba, Picrotoxinum 206–214
Lauraceæ, Laurel Family—Sassafras, Sassafras Medulla, Cinnamomum Cassia, Cinnamomum Saigonicum, Cinnamomum Zeylanicum, Camphora 214–225
Papaveraceæ, Poppy Family—Opium, Sanguinaria, Chelidonium . . 225–238
Cruciferæ, Mustard Family—Sinapis Alba, Sinapis Nigra . . . 238–242
Hamamelidaceæ, Witch Hazel Family—Hamamelis, Styrax . . . 242–246
Rosaceæ, Rose Family—Rubus Idæus, Rubus, Rosa Centifolia, Rosa Gallica, Oleum Rosæ, Quillaja, Cusso 247–259
Drupaceæ, Plum Family—Prunus Virginiana, Prunum, Amygdala Amara, Amygdala Dulcis 260–267
Mimosaceæ, Mimosa Family—Acacia, Catechu 267–274
Cæsalpinaceæ, Senna Family—Cassia Fistula, Senna, Tamarindus, Hæmatoxylon, Copaiba 274–288
Krameriaceæ, Krameria Family—Krameria 288–290
Papilionaceæ, Pea Family—Balsamum Peruvianum, Balsamum Tolutanum, Tragacantha, Santalum Rubrum, Kino, Glycyrrhiza, Scoparius, Chrysarobinum, Physostigma 290–312
Geraniaceæ, Cranesbill or Geranium Family—Geranium. . . . 312–315
Linaceæ, Flax Family—Linum. 316–318
Erythroxylaceæ, Coca Family—Coca 318–322
Zygophyllaceæ, Guaiacum or Bean-caper Family—Guaiaci Lignum, Guaiaci Resina 322–325
Rutaceæ, Rue Family—Xanthoxylum, Pilocarpus, Buchu, Aurantii Amari Cortex, Oleum Aurantii Florum, Aurantii Dulcis Cortex, Oleum Aurantii Corticis, Limonis Cortex, Limonis Succus, Oleum Bergamottæ. . 325–339
Simarubaceæ, Quassia Family—Quassia 339–343
Burseraceæ, Myrrh Family—Myrrha 343–345
Polygalaceæ, Milkwort Family—Senega. 345–348
Euphorbiaceæ, Spurge Family—Elastica, Oleum Tiglii, Cascarilla, Oleum Ricini, Stillingia, Kamala 348–363
Anacardiaceæ, Sumac(h) Family—Rhus Glabra, Rhus Toxicodendron, Mastiche 364–369
Celastraceæ, Spindle (Staff) Tree Family—Euonymus 369–370

PAGE
Sapindaceæ, Soapberry (wort) Family—Guarana 370–372
Rhamnaceæ, Buckthorn Family—Frangula, Rhamnus Purshiana . . 372–376
Vitaceæ, Grape Family—Vinum Album, Vinum Rubrum. . . . 377–379
Malvaceæ, Mallow Family—Althæa, Gossypii Radicis Cortex, Gossypium Purificatum, Oleum Gossypii Seminis 379-384
Sterculiaceæ, Silk Cotton Family—Oleum Theobromatis. . . . 385–387
Theaceæ (Ternstrœmiaceæ), Tea Family—Caffeina. 387-388
Guttiferæ, Gamboge Family—Cambogia 389-392
Thymelæaceæ, Mezereon Family—Mezereum 393-394
Lythraceæ (Punicaceæ), Loosestrife Family—Granatum. . . . 394–397
Myrtaceæ, Myrtle Family—Oleum Cajuputi, Caryophyllus, Pimenta, Oleum Myrciæ, Eucalyptus 397–409
Umbelliferæ, Parsley(Carrot)Family—Fœniculum, Anisum, Carum, Coriandrum, Conium, Asafœtida, Sumbul, Ammoniacum 410–429
GAMOPETALÆ 429–583
Pyrolaceæ, Wintergreen Family—Chimaphila. 429–430
Ericaceæ, Heath Family—Oleum Gaultheriæ, Uva-Ursi 430-436
Styracaceæ, Storax Family—Benzoinum 436–439
Oleaceæ, Olive Family—Oleum Olivæ, Manna 439–444
Loganiaceæ, Logania Family—Gelsemium, Spigelia, Nux Vomica . . 444–452
Gentianaceæ, Gentian Family—Gentiana, Chirata 452–456
Apocynaceæ, Dogbane Family—Apocynum, Strophanthus, Aspidosperma. 456–463
Asclepiadaceæ, Milkweed Family—Asclepias 464-465
Convolvulaceæ, Morning-glory Family—Jalapa, Scammonium . . 466–471
Hydrophyllaceæ, Waterleaf Family—Eriodictyon. 471–473
Labiatæ, Labiate (Mint) Family—Scutellaria, Marrubium, Salvia, Hedeoma, Melissa, Oleum Thymi, Mentha Viridis, Mentha Piperita, Oleum Lavandulæ Florum, Oleum Rosmarini 473–489
Solanaceæ, Nightshade (Potato) Family—Dulcamara, Capsicum, Belladonnæ Folia, Belladonnæ Radix, Hyoscyamus, Stramonii Folia, Stramonii Semen, Tabacum 490–507
Scrophulariaceæ, Figwort Family—Leptandra, Digitalis. . . . 507–516
Pedaliaceæ, Pedalium Family—Oleum Sesami. 516–518
Rubiaceæ, Madder Family—Caffeina, Ipecacuanha, Cinchona . . . 518–538
Caprifoliaceæ, Honeysuckle Family—Sambucus, Viburnum Opulus, Viburnum Prunifolium 538–542
Valerianaceæ, Valerian Family—Valeriana 542–545
Cucurbitaceæ, Gourd Family—Pepo, Colocynthis, Elaterinum, Bryonia . 545–552
Campanulaceæ, Bell-flower Family—Lobelia 552–555
Cichoriaceæ, Chicory Family—Taraxacum, Lactucarium. . . . 555–560
Compositæ, Composite (Thistle) Family—Eupatorium, Grindelia, Oleum Erigerontis, Inula, Calendula, Anthemis, Matricaria, Pyrethrum, Tanacetum, Absinthium, Santonica, Arnicæ Flores, Arnicæ Radix, Lappa . 560–583

PART II.

ORGANIC DRUGS FROM THE ANIMAL KINGDOM 585–614
Invertebrata 585–594
Hemiptera, Hemipterous Family—Coccus 585–589
Coleoptera, Coleopterous Family—Cantharis 589–592

PAGE
HYMENOPTERA, Hymenopterous Family—Mel, Cera Flava 592–594
Vertebrata 594-614
STURIONES, Sturionian Family—Ichthyocolla 594–596
TELEOST(EÆ)-IA, Teleostean Family—Oleum Morrhuæ 596-598
GALLINÆ, Gallinaceous Family—Vitellus 598–599
CETACEÆ, Cetaceous Family—Cetaceum 600-601
PACHYDERMATA, Pachyderma(l)-tous Family—Adeps, Pancreatinum, Pepsinum 601–604
RUMINANTIA, Ruminant Family—Moschus, Sevum, Adeps Lanæ Hydrosus, Fel Bovis, Saccharum Lactis 604–614

PART III.

INORGANIC DRUGS FROM THE MINERAL KINGDOM. 615-736

HYDROGEN AND OXYGEN—Aqua, Aqua Hydrogenii Dioxidi . . . 615-617
NITROGEN—Aqua Ammoniæ, Aqua Ammoniæ Fortior, Acidum Nitricum . 617–620
CARBON—Carbo Ligni, Carbo Animalis, Carbonei Disulphidum . . . 620–622
SILICON—Liquor Sodii Silicatis 622
BORON—Acidum Boricum 623
SULPHUR—Sulphur Sublimatum, Acidum Sulphuricum, Acidum Sulphurosum 623–627
PHOSPHORUS—Acidum Phosphoricum, Acidum Hypophosphorosum Dilutum 627–630
CHLORINE—Aqua Chlori, Acidum Hydrochloricum 630–632
BROMUM—Acidum Hydrobromicum Dilutum 632–633
IODUM—Syrupus Acidi Hydriodici 633–635
POTASSIUM—Potassii Carbonas, P. Bicarbonas, P. Acetas, P. Citras, P. Bitartras, P. Chloras, P. Hypophosphis, P. Cyanidum, P. Ferrocyanidum, P. Bichromas, P. Sulphas, P. Bromidum, P. Iodidum, P. Nitras, P. Permanganas, P. Sulphis, P. et Sodii Tartras, P. Tartras, Potassa, Potassa Sulphurata, etc. 635–650
SODIUM—Sodii Boras, S. Nitras, S. Nitris, S. Chloridum, S. Carbonas, S. Bicarbonas, S. Acetas, S. Benzoas, S. Bisulphis, S. Sulphis, S. Hyposulphis, S. Hypophosphis, S. Bromidum, S. Iodidum, S. Salicylas, S. Arsenas, S. Chloras, S. Phosphas, S. Pyrophosphas, S. Sulphas, S. Sulphocarbolate, Soda, etc. 650–663
LITHIUM—Lithii Carbonas, L. Benzoas, L. Bromidum, L. Citras, L. Salicylas, etc. 663–665
AMMONIUM—Ammonii Benzoas, A. Bromidum, A. Valerianas, A. Chloridum, A. Carbonas, A. Nitras, A. Iodidum, etc. 665–669
MAGNESIUM—Magnesii Sulphas, M. Carbonas, M. Citras Effervescens, Magnesia, Magnesia Ponderosa 669-672
CALCIUM—Calci Chloridum, C. Carbonas Præcipitatus, C. Bromidum, C. Hypophosphis, C. Phosphas Præcipitatus, C. Sulphas Exsiccatus, Calx, Calx Chlorata, Calx Sulphurata, Creta Præparata. 672–678
BARIUM—Barii Dioxidum, B. Chloridum, etc. 679–680
STRONTIUM—Strontii Bromidum, S. Iodidum, S. Lactas 680–682
ALUMINUM—Alumini Hydras, A. Sulphas, Alumen 682–684
CERIUM—Cerii Oxalas. 684–685

PAGE

FERRUM—Reductum, Ferri Chloridum, F. Iodidum Saccharatum, F. Lactas, F. Sulphas, F. Citras, F. Phosphas Solubilis, F. Pyrophosphas Solubilis, F. Oxydum Hydratum, F. Oxydum Hydratum cum Magnesia, F. Valerianas, F. Carbonas Saccharatus, F. Hypophosphis, F. et Quininæ Citras, F. et Ammonii Citras, F. et Potassii Tartras, F. et Ammonii Tartras, etc. 685–702
MANGANUM—Mangani Dioxidum, M. Sulphas 703–704
CHROMIUM—Acidum Chromicum 704–705
ZINCUM—Zinci Bromidum, Z. Chloridum, Z. Iodidum, Z. Phosphidum, Z. Sulphas, Z. Valerianas, Z. Carbonas Præcipitatus, Z. Oxidum, Z. Acetas, etc. 705–709
CADMIUM 710
PLUMBUM—Plumbi Carbonas, P. Oxidum, P. Oxidum Rubrum, P. Acetas, P. Nitras, P. Iodidum, etc. 710–714
CUPRUM—Cupri Sulphas, C. Acetas, C. Subacetas 714–716
BISMUTHUM—Bismuthi Subnitras, B. Citras, B. Subcarbonas, B. Oxidum, B. Salicylas, etc. 716–718
ARGENTUM—Argenti Nitras, A. Cyanidum, A. Iodidum, A. Oxidum, etc. 718–721
HYDRARGYRUM—Hydrargyri Iodidum Flavum, H. Subsulphas Flavus, H. Chloridum Corrosivum, H. Chloridum Mite, H. Oxidum Rubrum, H. Sulphidum Rubrum, etc. 721–729
ARSENUM—Acidum Arsenosum 729–731
ANTIMONIUM—Antimonii Sulphidum, A. Oxidum, etc. 731–735
STANNUM, AURUM, PLATINUM 735–736

PART IV.

ORGANIC CARBON COMPOUNDS. 737–768

HYDROCARBONS—Benzinum, Petrolatum Liquidum, Petrolatum Molle, Petrolatum Spissum, Bitumen, Rigolene 738–740
ALCOHOLS—Alcohol, Spiritus Frumenti, Spiritus Vini Gallici, Alcohol Amylicum, Glycerinum, Spiritus Glonoini 740–745
ALDEHYDES—Paraldehydum, Chloral Hydras, Chloroformum, Iodoformum. 745–751
ACIDS—Aceticum, Aceticum Glaciale, Oleicum, Stearicum, Oxalicum, Tartaricum, Citricum, Lacticum. 751–757
ETHERS—Æther, Æther Aceticus, Spiritus Ætheris Nitrosi, Amyl Nitris. 757–761
PHENOLS—Acidum Carbolicum, Creosotum, Resorcinum, Salol 761–766
NAPHTOLS—Napht(h)alinum, Naphtol 766–767
ANILIDS, Anilines—Acetanilidum 767–768

PART V.

NON-PHARMACOPŒIAL ORGANIC CARBON COMPOUNDS 769–806

HALOGEN DERIVATIVES—Pental, Methyl Chloride, Methylene Bichloride, Methylene Blue, Bromoform, Ethyl Chloride, Ethylene Bichloride, Ethylidene Chloride, Ethyl Bromide, Ethylene Bromide . . . 772–775

PAGE
Oxygen Derivatives—Methyl Alcohol, Amylene Hydrate, Formaldehyde, Urotropine, Tannoform, Butyl Chloral Hydrate, Chloral Formamide, Chloralose, Acetone 776–779
Sulphur Derivatives—Sulphonal, Trional, Tetronal, Trichlor Acetic Acid, Methylal 779–781
Urea Derivatives—Urethane, Euphorin, Ural, Somnal, Sucrol, Thiosinamin 781-782
Thiophene Derivatives—Thiophene Di-iodide, Sodium Thiophene-sulphonate 783
Terpenes—Terebene, Terpin Hydrate 783
Phenol Derivatives—Bromol, Aseptol, Sozoiodol, Sulphaminol, Cresol, Benzo-para-cresol, Creolin, Lysol, Losophane, Aristol, Ichthyol, Europhen, Dermatol, Airol, Bismuth Subsalicylate, Bismuth Tribromphenol (Xeroform), Antiseptin 783–788
Di-hydroxy Phenol Derivatives—Guaiacol, Eugenol, Eugenol Acetamide, Thioresorcin, Hydroquinone 788–791
Benzene (Amido) Derivatives—Formanilid, Antisepsin, Iodo-acetanilid, Exalgin, Methacetin, Phenacetin, Lactophenin, Sedatin, Benzanilid, Gallanilid, Phenocoll Hydrochloride, Salocoll, Hydracetin, Hypnone, Gallacetophenone, Agathin 791–797
Carboxyl Derivatives—Saccharin, Benzoic Acid 797
Oxybenzoic (Salicylic) Derivatives—Di-iodo-salicylic Acid, Sodium dithio-salicylate, Meta-Cresalol, Betol, Salacetol, Salophen . . . 797–799
Para-oxybenzoic Derivatives—Anisic Acid, Orthoform, Camphoric Acid 799–800
Napht(h)alene Derivatives—Benzo-naphtol, Di-iodo-beta-naphtol, Asaprol, Anthrarobin 799-801
Organic Bases—Piperazine, Diaptherin, Analgen, Orexine Hydrochloride, Thalline, Thalline Sulphate, Thalline Tartrate, Antipyrine, Salipyrine, Hypnal, Iodopyrine, Iodol, Eucaine, Theobromine, Diuretin . . . 801-806

PART VI.

THE MICROSCOPE AND ITS USE IN MATERIA MEDICA 807–825

Description of the Microscope 807–812
Requisites of a Good Microscope 812–814
Directions for Using the Microscope 814–815
Accessory Apparatus and Reagents 815–818
Some Advanced Microscopic Methods and Appliances 819–821
The Microscope in the Drug-store 821–825

APPENDIX.

Poisons—Treatment and Antidotes 827–838
Prescription Writing of the Physician 838–841
Tables of Weights, Measures, Doses, Drops, Thermometers, Abbreviations, Constituents 841–853
Index 855–885

ABBREVIATIONS USED THROUGHOUT THIS WORK.

The degree sign (°) associated with numerals indicates *feet*, except when accompanied with the capital letters C. and F., then it represents *degrees* (temperature); the prime sign (′) attached to figures is used for *inches*, but when over italic vowels denotes the *accented syllable*.

Ar., Arabic.
Br., British.
Eng., English.
Fr., French.
Ger., German.
Gr., Greek.
Heb., Hebrew.
Hind., Hindoo.
OE., Old English.
Per., Pers., Persian.
Portg., Pg., Portuguese.
Skr., Skt., Sanskrit.
Sp., Spanish.
C., Centigrade.
F., Fahrenheit.
Mt., Mount, mountain.
Adj., adj., Adjective.

Dim., dim., Diminutive.
Contr., contr., Contraction.
Prep(s)., Preparation(s).
P. p., pp., Past participle.
Unoff., Unofficial.
Syn., Synonym.
Fr., fr., From.
Tr., Tinct., Tincture.
Dil., dil., Dilute(d).
Alc., alc., Alcohol.
U. S. P., United States Pharmacopœia.
Q. S., q. s., Sufficient quantity.
P. c., p. c., Per cent(um).
Cc., Cubic centimeter.
L., Liter.

Ml., Milliliter.
M., Meter.
Mm., Millimeter.
Cm., Centimeter.
Gm., Gramme.
Kg., Kilogramme.
Km., Kilometer.
♏, min., Minim.
Gr., gr., Grain.
℔, Pound.
ʒ, Drachm (solid or fluid).
℥, Ounce (solid or fluid).
℈, Scruple.
ss, Half.
+ (plus), — (minus).
= (equals), □ (square).

THE GREEK ALPHABET.

Α	α	a	Alpha.	Ν	ν	n	Nu.
Β	β	b	Bēta.	Ξ	ξ	x	Xi.
Γ	γ	g	Gamma.	Ο	ο	o short	Omīcron.
Δ	δ	d	Delta.	Π	π	p	Pi.
Ε	ε	e short	Epsīlon.	Ρ	ρ	r	Rho.
Ζ	ζ	z	Zēta.	Σ	σ ς	s	Sigma.
Η	η	e long	Eta.	Τ	τ	t	Tau.
Θ	θ ϑ	th	Thēta.	Υ	υ	u	Upsīlon.
Ι	ι	i	Iota.	Φ	φ	ph	Phi.
Κ	κ	k	Kappa.	Χ	χ	ch	Chi.
Λ	λ	l	Lambda.	Ψ	ψ	ps	Psi.
Μ	μ	m	Mu.	Ω	ω	o long	Omĕga.

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MATERIA MEDICA AND PHARMACOLOGY.

DISEASE seems to have been man's natural inheritance, while curative methods and remedies are largely his adaptation and creation. From early biblical times the ills "that flesh is heir to" were recognized as a deadly menace to the human family, and whether the vain appeal was made, then or since, to either (for each in turn enjoyed a period of favor) fetishism, sorcery, religious incantations, faith, Christian science, astrology, magic-art, enchantment, witchcraft, spells, charms, hydropathy, venesection, or drugs, the same inherent hope and purpose has ever prevailed—to relieve and palliate physical suffering. Modern thought, happily, is no longer so speculative and superstitious, consequently universal intelligence has allowed medical appliances and treatment to be shaped into a systematic and veritable science.

MATERIA MEDICA (L. medical material) is a treatise upon the materials, agents, appliances, etc., used in medicine, including their name, source or origin, habitat, family or natural order (organic), physical characteristics, methods by which obtained, tests for purity and adulterations, constituents or composition, forms of administration (preparations), physiological action or properties, uses or therapeutics (therapy), normal and lethal doses, antagonists, incompatibilities, synergists (organic and inorganic), and other important features.

PHARMACOLOGY (Gr. *φάρμακον*, a medicine, + *λόγος*, discourse) is a similar but more modern term, implying the sum of scientific knowledge of drugs, which is taken to include their art of preparation—pharmacy—and all that is known of their action—pharmacodynamics—being at present usually restricted to this latter meaning.

The subject in its entirety is so broad and comprehensive that subdivisions have been made, and to some of these distinctive names are given.

1. *Pharmacy* (Gr. *φαρμακεία*, the use of drugs): comprising the art of preparing drugs in suitable forms for dispensation, administration, or application, and includes an acquaintance with much of materia medica, practical and theoretical chemistry, and many manipulations peculiar to itself.

2. *Pharmacognosy* (Gr. *φάρμακον*, a drug, + *γνῶσις*, knowledge): comprising the study of physical and chemical characters of drugs—the knowledge of selecting, recognizing, identifying true and false specimens by such characteristics.

3. *Pharmacodynamics* (Gr. *φάρμακον*, a drug, + *δύναμις*, power): comprising the knowledge of physiological action—power or strength of remedial agents on living organisms of man or lower animals during health.

4. *Toxicology* (Gr. *τοξικόν*, poison, + *λόγος*, discourse): comprising the effect, nature, and detection of drugs when given in poisonous doses—the treatment and antidotes for same.

5. *Therapeutics* (Gr. *θεραπεύειν*, to cure): comprising the intelligent application or use of agents to cure disease—how they act on living organisms during sickness; (*a*) *rational*, when based upon known laws of the remedies and diseases, as gained through pathology, physiology, and pharmacodynamics, thereby giving the only scientific treatment; (*b*) *empirical*, when based solely upon clinical observation and experience—the employment of a remedy in any pronounced disease, from its valuable service in previous similar cases; (*c*) *general*, where other than drugs or medicines are used for curative purposes: 1. Hygienic agents—cleanliness, pure air, ventilation, proper food and clothing, rest, etc.; 2. Mechanical agents (semi-surgical)—bleeding, leeches, cups, scarifications, issues, setons, frictions, massage, aspiration, acupuncture, sprays, syringes, catheters, bed-pans, urinals, hot-water bags, trusses, pessaries, suspensaries, bandages, rubber stockings, jackets, thermometers, etc.; 3. Physical agents—Heat: solar, artificial (dry or moist vapor), baths—tepid, 29–35° C. (85–95° F.), warm, 35–38° C. (95–100° F.), hot, 38–41° C. (100–106° F.), Turkish, 35–71° C. (95–160° F.), hip or sitz, hot wet-pack; Cold: plunge or shower bath, 4–15°C. (40–60° F.), cold wet-pack, rubbing wet-pack, 4–21° C. (40–70° F.), sponging, ice-bag, compresses, douches; Light is tonic, darkness is sedative; Air: pure, impure, compressed, hot, 93–149–204° C. (100–300–400° F.); Electricity: continuous (galvanic) and induced (faradic) currents, static (frictional) by electric bath, spark, Leyden-jar shock, brush.

Upon the general subject of materia medica, and each of these subdivisions, there are very many published works, but only pharmacy has what might be termed a standard code for reference.

The Pharmacopœia, U. S. P. (Gr. *φάρμακον*, a drug, + *ποιεῖν*, to make), is such a standard for us, and other countries each have, in a measure, their own. In this are enumerated the most important and reliable drugs with their preparations, which list is, however, more or less changed in conformity with scientific progress, at each decennial edition.

The Dispensatories, several in number, are reference-works—in fact, materia medicas of the most liberal form, treating not only of the five departments as previously defined, but exhaustively of all other phases of the various sciences bearing upon each drug, official or non-official. Owing to their scope and reliability, they are regarded by our profession with scarcely less favor and authority than the Pharmacopœia.

FORMS IN WHICH MEDICINES CAN BE USED.

In early times the crude drugs were usually administered, but some being insoluble, nauseous, irritating, bulky, and ill-suited for either internal or external application led other forms to be adopted, such as decoctions, infusions, juices, powders, pills, ointments, etc. At the present day elegant pharmacy has placed us in possession of additional and still more acceptable forms and shapes, the most important being here enumerated.

I. OFFICIAL (liquids, semi-solids, and solids).

1. *Acetum, Aceta* (vinegars).—10 p. c. Macerate with diluted acetic acid, filter. Opii, Scillæ.

2. *Aqua, Aquæ* (waters).—Distilled water impregnated with a volatile substance, by (*a*) *trituration*, Anisi, Menthæ Viridis: (*b*) *solution*, Amygdalæ Amaræ, Rosæ: (*c*) *aëration*, Ammoniæ, Chlori: (*d*) *distillation*, Aurantii Florum Fortior, Rosæ Fortior.

3. *Ceratum, Cerata* (cerates, L. *cera*, wax).—Unctuous like ointments, but made firmer by the addition of wax; soften but do not melt at body-temperature; only liquify above 40° C. (104° F.): Camphoræ, Plumbi Subacetatis.

4. *Charta, Chartæ* (papers).—Papers coated—Sinapis, or saturated with—Potassii Nitratis, some medicinal substance to be used as a plaster or for burning.

5. *Collodium, Collodia* (collodions).—Collodion impregnated with medicinal substances for protection and medical effect: Cantharidatum, Stypticum.

6. *Confectio, Confectiones* (confections, boluses, L. *conficere*, to put together).—Pasty masses of drugs triturated with sugar or honey: Rosæ, Sennæ.

7. *Decoctum, Decocta* (decoctions, L. *decoquere*, to boil down).—5 p. c. aqueous solutions of vegetable drugs made by boiling the substance about 15 minutes in a closely covered vessel, and allowing to cool therein, then straining: Cetrariæ, Sarsaparillæ Compositum.

8. *Elixir, Elixira* (elixirs, Ar. *el-ik'sir*, the philosopher's stone).—Sweet, aromatic, hydro-alcoholic, medicated liquids: alcoholic strength 20–25 p. c.: Aromaticum (for flavoring), Phosphori.

9. *Emplastrum, Emplastra* (plasters, Gr. *εμπλάσσειν*, to daub on).—Substances fused in such proportions as to adhere at body-temperature. Some are spread, others are not. Ammoniaci cum Hydrargyro, Saponis.

10. *Emulsum, Emulsa* (emulsions, L. *emulgere*, to milk out).—Aqueous, milky-like mixtures of oils, fats, or resins in a minutely subdivided state, suspended by mucilaginous materials; coagulated by acids, metallic salts, or spirituous liquids in large quantities: Ammoniaci, Chloroformi.

11. *Extractum, Extracta* (extracts, L. *ex*, out, + *trahere*, to draw).—Solid or semi-solid, made by evaporating medicinal solutions, or expressed juices of organic drugs, until representing 4 or 5 times the strength of the crude substance; these may be aqueous, alcoholic, hydro-alcoholic, acetous: Aconiti, Uvæ Ursi.

12. *Extractum Fluidum, Extracta Fluida* (fluid extracts).—Solutions of organic drugs evaporated until 1 Cc. represents the activity of 1 Gm. of crude drug: Aconiti, Zingiberis.

13. *Glyceritum*, *Glycerita* (glycerites, Gr. *γλυκύς*, sweet).—Solutions of a drug in glycerin for external use: Acidi Carbolici, Vitelli.

14. *Infusum*, *Infusa* (infusions, L. *infundere*, a watering).—5 p. c. aqueous solutions of vegetable drugs, made by adding to the substance usually boiling water in a closely covered vessel and allowing to cool therein, then straining; some are made by cold percolation: Cinchonæ, Sennæ Compositum.

15. *Linimentum*, *Linimenta* (liniments, L. *linere*, to smear).—Medicinal liquids, usually containing a fixed or volatile oil, for external use by rubbing or by simple application: Ammoniæ, Terebinthinæ.

16. *Liquor*, *Liquores* (liquors, L. *liquor*, *liquere*, fluid, liquid).—Mostly aqueous solutions of non-volatile chemical substances: Acidi Arsenosi, Zinci Chloridi.

17. *Massa*, *Massæ* (masses, Gr. *μάσσειν*, to knead).—Pill-masses preserved in bulk to be used from when required: Copaibæ, Hydrargyri.

18. *Mel*, *Mella*, *Mellita* (honeys, Gr. *μέλι*, honey).—Medicines mixed with clarified honey instead of syrup: Despumatum, Rosæ.

19. *Mistura*, *Misturæ* (mixtures, L. *miscere*, to mix).—Liquids of insoluble medicines suspended in water by some viscid substance, or solutions of one or more active liquids: Cretæ, Rhei et Sodæ.

20. *Mucilago*, *Mucilagines* (mucilages, L. *mucere*, to be mouldy, slimy).—Saturated aqueous adhesive liquids of gum or starch; Acaciæ, Ulmi.

21. *Oleatum*, *Oleata* (oleates, L. *olea*, Gr. *ἐλαία*, olive tree, oil).—Solutions of medicines (alkaloids or metallic salts) in oleic acid: Hydrargyri, Zinci.

22. *Oleum*, *Olea* (oils, L. *oleum*, Gr. *ἔλαιω*, oil).—Liquid active constituents obtained by (*a*) *distillation:* Æthereum, Thymi; (*b*) *expression:* Adipis, Tiglii; (*c*) *solution:* Phosphoratum.

23. *Oleoresina*, *Oleoresinæ* (oleoresins, L. *oleum*, oil, + *resina*, resin).—Natural solutions of resin in volatile oils, extracted by ether: Aspidii, Zingiberis.

24. *Pilula*, *Pilulæ* (pills, L. *pilula*, a little ball, dim. of *pila*, a ball. Eng. abbr., *pil*, pl. *pill*).—Spherical or oval masses of medicine held together by some adhesive substance: Aloes, Rhei Compositæ.

25. *Pulvis*, *Pulveres* (powders, L. *pulverare*, to powder).—Finely powdered drug or drugs, with or without a diluent, as milk-sugar: Antimonialis, Rhei Compositus.

26. *Spiritus*, *Spiritus* (spirit, spirits, L. *spirare*, to breathe, exhale).—Alcoholic or hydro-alcoholic solutions of volatile medicinal substances (chiefly volatile oils): Ætheris, Vini Gallici.

27. *Suppositorium*, *Suppositoria* (suppositories, L. *supponere*, to place underneath).—Solids of suitable form containing medicines, which when inserted into the rectum, nares, urethra, or vagina melt down: Glycerini.

28. *Syrupus*, *Syrupi* (syrups, Ar. *shurab*, a drink, beverage).—Concentrated solutions of sugar, the menstruum being an aqueous solu-

tion of either medicinal or flavoring agents (simple syrup menstr. plain water): Acaciæ, Zingiberis.

29. *Tinctura, Tincturæ* (tinctures, L. *tingere*, to dye).—Alcoholic or hydro-alcoholic solutions of non-volatile (except iodine) drug-constituents: Aconiti, Zingiberis.

30. *Trituratio, Triturationes* (triturations, L. *triturare*, triturated).—Fine powders of medicinal substances 10 p. c. triturated with sugar of milk 90 p. c.: Elaterini.

31. *Trochiscus, Trochisci* (troches, Gr. *τροχίσκος*, a pill, troche).—Solid, round, oval, or flat masses of one or more medicinal agents, with sugar or extract of liquorice, or both, caused to adhere by mucilage: Acidi Tannici, Zingiberis.

32. *Unguentum, Unguenta* (ointments, L. *unguere*, to smear, anoint).—Soft or solid fatty preparations, for external use, liquefying when rubbed upon the skin, and containing medicine in a basis of lard, benzoinated lard, olive, almond, or lard oil, suet, wax, spermaceti, or paraffin: Acidi Carbolici, Zinci Oxidi.

33. *Vinum, Vina* (wines, L. *vinum*, wine).—Liquids differing from tinctures in being extracted with white wine, or a mixture of white wine and alcohol (20–25 p. c.): Antimonii, Opii.

II. NON-OFFICIAL.

1. *Abstracts, Abstracta.*—Powders having twice the strength of the vegetable substance, made by exhausting crude drugs, as a rule, with alcohol, recovering same, and incorporating residue with milk-sugar.

2. *Bougies, Pencils.*—Small solid cylinders of gelatin, glyco-gelatin mass (white gelatin 3, glycerin 1), or cacao-butter, impregnated with medicine, to be inserted into urethra, vagina, rectum, or nares.

3. *Cachets* (*de pain*), *Konseals, Wafers.*—Various sized concave wafers made of unleavened-bread (flour and water), or wafer paper, the cavity formed by moistening the concave edges of two and pressing together is to contain the drug; when fastened take by floating them in a gulp of water.

4. *Capsules, Capsulæ.*—Various sized, transparent casings (short tubes, usually with one open end fitting over that of another), of gelatin, hard or soft, for administering nauseous or disagreeable liquids or solids.

5. *Cataplasms, Cataplasmata, Poultices.*—Soft, pasty masses to supply moisture and warmth locally in order to break down inflamed subtissues; flaxseed meal, slippery elm, hops, bread and milk, bran, oatmeal, etc., answer well for these, to which either tincture of opium, aconite, arnica, etc., may be added to reduce pain. Poultices should be made by bringing moistened mass to a boil, enclosing same in a cheese-cloth bag, and applying one-half to one inch thick over inflamed area; the addition of a little fixed oil or glycerin serves to retain heat and prevent caking, while a covering of oiled silk retains these properties all the longer.

6. *Collyrium, Collyria, Eye-washes.*—Liquid applications for the eyes, usually composed of some astringent salt dissolved in rose water.

7. *Cigarettes.*—Have paper wrapper but filler of one or more medicinal substances, cubeb, stramonium, etc.

8. *Enemas, Enemata, Clysters.*—Liquids to be injected into the rectum. When large quantity (℥xvj–32; .5–1 L.), it is to act mechanically in emptying the bowel, and warm soapy or mucilaginous water answers the purpose; when small quantity (℥ij–4; 60–120 Cc.), it is to act as a medicine or nutrient, and after injection a towel pressed against the anus tends to aid retention, therefore absorption.

9. *Essences, Essentiæ.*—Liquids like our spirits (a name which they yet sometimes receive), 10 p. c., but in England 20 p. c.

10. *Fomentations, Fomenta.*—Flannels wrung out of hot water and applied with or without medication.

11. *Gargles, Gargarismata.*—Aqueous medicinal liquids for gargling the throat.

12. *Injections, Injectiones.*—Usually aqueous solutions of drugs to be injected by a syringe into the rectum (enemas), under the skin (hypodermic), or into the urethral, nasal, aural, or vaginal tract.

13. *Inhalations, Inhalationes, Vapors, Vapores.*—Volatile liquid vapors breathed at ordinary inhalation, to act locally upon the respiratory mucous membrane.

14. *Insufflations, Insufflationes.*—Fine powders of active medicine and mostly bland bases, to be blown into nares, larynx, throat, etc.

15. *Lotions, Lotiones.*—Mostly weak, aqueous medicinal solutions, to be applied locally on linen, lint, or muslin.

16. *Lozenges, Tablets, Tabellæ.*—Same as troches, being small flattened cakes of medicinal substances, with sugar, an adherent and usually some flavoring material; in England restricted to those having as a basis chocolate, and of definite weight.

17. *Oxymella, Oxymellita.*—Liquid composed of honey 80 parts, acetic acid 10, water 10; used to incorporate nauseous medicines.

18. *Paste.*—Name often applied to any and all ointments.

19. *Parvules, Granules, Dosi-metric Parvules.*—Very small pills, usually sugar-coated and containing poisonous alkaloids or chemicals.

20. *Pastilles, Pastillus, Pastilli.*—Same as troches; in England, restricted to those having glyco-gelatin as a base.

21. *Scales, Lamellæ.*—Thin scales, disks, or plates of medicinal substances; in England restricted to gelatin, and glycerin, to be dropped into the eye, each weighing gr. $\frac{1}{50}$ (.0013 Gm.).

22. *Sprays, Nebulæ.*—Usually aqueous medicinal solutions, to be used in atomizers, for throat, etc.

23. *Succus, Succi, Juices.*—Vegetable liquids expressed and preserved with alcohol.

24. *Tablet Triturates, Compressed Tablets.*—The former consist of the drug along with milk-sugar or cane-sugar, made into a pasty mass with either alcohol, water or syrup in some proportion, then pressed lightly into suitable moulds and dried; the latter consist of the pure or diluted drug, made to cohere by heavy compression in strong metallic molds. *Dragée* (dra-zha), is the name given in France to the

ordinary sugar-coated pill. *Enteric Pills* (Gr. ἔντερον, intestine), such as are coated with a substance, as salol, keratin, etc., to allow passage through the stomach intact, thereby not becoming dissolved until the duodenum or intestinal tract is reached. *Concentric Pills* are made of concentric layers of different ingredients to become dissolved and active at various points of the intestinal tract.

The Avenues By and Through which Medicines Enter the System.

1. *By Stomach: Gastro-intestinal Route.*—This is the most common and convenient method. After medicines are swallowed they enter circulation through the walls of the blood-vessels (which permeate the mucous membrane of the stomach and intestines), portal veins, and lacteals; so that when the intestinal contents reach the ileo-cæcal valve it consists of excrementitious matter and food refuse. If the stomach be healthy and empty, crystalloids in solution quickly pass through the vessel-walls, but colloids (albumin, fats, gelatin, gums, etc.) have to be digested and emulsified before they can be absorbed. In the stomach the albuminous drugs (proteids) are transformed, by pepsin and gastric juice, into soluble peptones, and there as such these, along with soluble crystalline salts, readily diffuse into the blood, often giving positive effect within an hour; the sugar, starchy, fatty, gummy, gelatinous, resinous, gumresinous and oleoresinous drugs, without suffering much change from the stomach secretions, pass into the duodenum where the bile, intestinal and pancreatic juices, within three to four hours, convert the starches into sugar (which in part may finally go into lactic acid and fat), emulsionize and saponify the fats, oils, etc., separating them into glycerin and fat acids, which latter, meeting alkaline bases, form diffusible soaps; the resins, alone and in combination, within four to ten hours, become broken up by these same alkaline juices (associated alkaline salts often facilitating), and are either converted into a soluble form for systemic ingestion, or are simply eliminated from the liver [whose secretion (bile) they have stimulated], thereby being allowed to pass into the larger intestine to stimulate intestinal gland secretion, or to act somewhere along the tract as a local irritant or stimulant, thereby aiding peristalsis. All drugs taken from the intestinal canal have to pass through the liver before reaching general circulation, and in this passage they may become medicinally very much changed, modified, or even destroyed—again some drugs may be excreted into the intestine along with the bile, and never reach further circulation, hence, these disadvantages, along with that of required palatable form, preclude sometimes its adoption.

2. *By Skin:*
    1. *Hypodermic.*—This consists in injecting medicinal solutions (♏ 5–15; .3–1 Cc.) into subcutaneous areolar tissue with a syringe (needle), which is always more or less painful. Quick absorption takes place by the lymphatics and capillary vessels, giving

us the advantage of full action of the quantity of drug used, without any possible changes from the intestinal secretions or processes; must here employ only clear, neutral (never acid), aqueous solutions of drugs, as otherwise intractable sores, sloughing, etc., might result around the punctures; must also avoid veins, injecting only on the external parts of the legs, thighs, arms, also abdomen, back and buttocks (4 Cm.; $1\frac{1}{2}'$ behind the great trochanter). In the process of *hypodermoclysis* a sterilized trocar is employed, and several pints of saline solution ($\frac{7}{10}$ p.c.) injected, to antagonize, wash out and dilute any septic poison (uræmia, septicæmia), cholera-collapse, diabetic coma, shock, etc.; here insert trocar in subcutaneous tissue of abdomen or thigh.

2. *Epidermic.*—Here medicines are incorporated in lanolin or other fats, and rubbed with friction directly upon the skin, thus promoting their passage through and between epidermal cells; best to apply where skin is thinnest (axillæ, groins, abdomen, insides of thighs) in the form of ointments, oleates or oils. This method is also called *inunction.*
3. *Enepidermic.*—Here medicines are applied to the skin without friction; chloroformic and oleic acid solutions of the alkaloids (aconitine, atropine, morphine, strychnine) pass by osmosis most easily; solutions in a mixture of chloroform and alcohol nearly as fast; aqueous solutions slower, while pure alcohol causes an outward osmotic flow. In this way medicinal effect is secured through plasters and poultices.
4. *Endermic.*—Here we first produce a blister on the skin, by the use of strong ammonia water (saturated cloths), or cantharides (cerate, collodion), remove with scissors the epidermis, and then upon the denuded surface (derma) apply the powdered medicine—morphine, atropine, quinine, strychnine, etc.; at present little employed.

3. *By Rectum.*—This is accomplished by enemas or suppositories, being best suited to disagreeable tasted alkaloids, acid solutions, etc. While absorption is usually twice as slow by this method as by the stomach, yet salts of atropine and morphine in solution enter circulation just as quickly, while those of strychnine more quickly than even by the mouth.

4. *By Lungs: Respiration.*—Vapors of liquids or solids are inhaled with the air, thereby bringing the system quickly under the drug's influence. Some vaporize at all ordinary temperatures, others at that of the body, while many have to be heated. Most anæsthetics act by this method.

5. *By Arteries: Arterial Transfusion.*—Large quantities of fluid (defibrinated blood, etc.) can be introduced into circulation, through the radial or posterior tibial, by the transfusion syringe. This is safer than by the veins, from the less likelihood of admitting air or producing thrombosis, in as much as the injected solution has to traverse

the capillaries prior to reaching the right side of the heart, thereby avoiding any likely sudden distention.

6. *By Veins: Intravenous Injection.*—This is the most perilous of all methods, only being resorted to in extreme emergencies to save life; thus blood or milk in hemorrhage, epilepsy, uræmia, cholera-collapse; saline solutions in cholera-collapse, diabetic coma; diluted ammonia water, ether, brandy or whiskey in bites of reptiles, venomous insects, hydrocyanic-acid poisoning, opium-narcosis, chloroform-asphyxia. It is better here to inject into a vein of the leg than of the arm, so that the drug may be less concentrated when it reaches the heart, thereby avoiding possibly any cardiac depression.

7. *By External Application.*—Many powdered medicines when dusted on abraded surfaces, or applied by insufflation to the nares, fauces, larynx, become gradually absorbed and affect the system locally and generally; this equally applies to drops and washes when introduced into the eyes and ears, also to atomized vapors, sprays, etc. The method known as *cataphoresis* consists of producing osmosis of medicines by the galvanic current, the positive pole being medicated and placed over the affected part, the negative slightly remote, and only affects tissues between the poles.

THE MEANS BY WHICH MEDICINES ARE TRANSMITTED THROUGH THE SYSTEM.

It was for a long time believed that drugs radiated from the seat of application throughout the system, by the nerves; this is now known to be false, and, instead, we recognize the blood to be the common carrier; thus the blood has to take up the drug in solution before there will be other than a local effect, and when once dissolved in it the periodic rounds of circulation are regularly made with this impregnation, so that the system, as a whole, responds to the medicine's influence. As proof of this, we find that blood taken from any portion of the body, near or far from the point of application, contains the drug; also the blood of persons poisoned when injected into others produces similar poisonous symptoms; if you interrupt the blood-circulation to any part, no poison will be transmitted to that part; as other secretions are nourished by the blood you would expect them also to have similar medical properties and such is the case—milk, sweat, urine, etc.; if we inject medicines directly into the blood (a dangerous process), we soon have characteristic action. The blood is enabled to absorb these through the intervention of the veins, lymphatics, and lacteals; while it eliminates them, even often to the extent of irritation, through the excretory organs, kidneys, bowels, skin, etc.

CONDITIONS WHICH MAY MODIFY THE ACTION—HENCE THE DOSE OF DRUGS.

The identical drug does not produce like results in every person, nor do different specimens of the same drug cause the precise effects upon the one individual, though taken in exact quantities; the causes of this are several:

1. *Age.*—While the adult dose is about uniform (being based upon the average weight of 150 lbs.; 68 Kg.), and holds good between the ages of twenty to sixty, yet that from infancy to majority is variable and has to be computed by the following rules: Dr. Cowling's applies to any age up to and including the twenty-fourth year, and is thus: The age at the next birthday is divided by 24, and that fraction of the adult dose gives the quantity sought. Child one year at coming birthday $= \frac{1}{24}$ of adult dose; gentian, gr. 30, hence $\frac{1}{24}$ of 30 = gr. $1\frac{1}{4}$. Dr. Young's applies to any age up to twelve years, and is thus: The age at the coming birthday divided by that age plus 12. Child two years at next birthday $= \frac{2}{2+12} = \frac{2}{14} = \frac{1}{7}$ of adult dose; cinchona, gr. 40, hence $\frac{1}{7}$ of 40 = gr. $5\frac{5}{7}$. Dr. Brunton's applies to metric doses, and is thus: Multiply the adult quantity by the approaching birthday, and that again by 4, then remove the decimal point two places to the left. Adult dose of catechu is 1 Gm., and for a child five years old at its next birthday $= \frac{1. \times 5 \times 4}{100} = .2$ Gm.

Very old persons are extremely susceptible to strong or even ordinary medication, all doses having usually to be diminished. Children are very acute to opium and many anodynes, yet tolerate larger purgatives (including castor oil, calomel, rhubarb, cod-liver oil, iron, belladonna, ipecac, pilocarpine, squill, arsenic, chloral) than the rules would indicate.

2. *Mode of Administration.*—This has much to do with the rate of absorption, hence controls the dose. Thus the dose hypodermically is one-half that by the mouth or one-fourth that by the rectum, and this difference depends upon the rapidity of absorption—the hypodermic being the quickest, the rectum the slowest. On a full stomach medicines enter circulation much slower than on an empty one.

3. *Form of the Drug.*—This controls largely the rate of absorption, hence, the dosage. Before any substance enters circulation it must be in solution, and the nearer medicines approach the liquid form the quicker will they have effect and the smaller will be the doses required, consequently, it takes less in tincture than in powder or pill form.

4. *Condition of the Drug.*—The same species do not always produce drugs of uniform strength; thus cinchona, opium, nux vomica, rhubarb, senna, etc., are by no means regular, as the total alkaloids of cinchona may range from 2–10 p. c.; opium, 4–24 p. c., etc., therefore, to have like results varying quantities must be given. This strength-difference is due largely to soil, climate, cultivation, season of year when collected, curing, duration on the market, possible adulterations, etc.

5. *Conditions of the Individual.*—These are not always the same; sex, race, temperament, idiosyncrasy, climate, occupation, imagination, mental emotion, disease, and habitual-use all affect the dosage required in individual cases. Thus, females demand less than males; strong, burly races more than weaker ones; sanguine temperaments cannot tolerate stimulants; nervous temperaments must use purgatives cau-

tiously; bilious temperaments need mercurials, while to lymphatic temperaments these are injurious. Idiosyncrasies vary in people—some vomit at the odor of ipecac or purge by smelling croton oil; others are little or greatly affected by opium, mercury, arsenic, belladonna, cocaine, iodides, etc. Warm climates demand smaller doses of purgatives and larger doses of antiperiodics. Occupation controls largely doses, as those exposed and under hard labor require unlike quantities to those in light pursuits, sedentary habits, indoor surroundings, etc. Imagination has its effect, as in a degree one's frame of mind can will or not will results. Mental emotions require, as a rule, larger doses than the normal. Habitual-use lessens medicinal power, the dose having to be gradually increased, as in cathartics, opium, arsenic, etc. Disease modifies dose, as in tetanus, peritonitis, cancer, cholera, etc., excessive quantities of morphine are required and well tolerated; in typhoid fever abnormal amount of stimulants can be used, as alcohol, brandy, etc.; in pneumonia excessive doses of tartar emetic can be given without nausea, while during menstruation, lactation, pregnancy, etc., smaller doses must be administered.

6. *Incidental Conditions.*—Besides the preceding, we have some other factors influencing the variability of doses: State of the stomach, empty, full, active, sluggish, etc., under certain troubles it will not assimilate medicines at all, when administration must be by other channels. Cumulative action of some drugs requires cautious doses; this may arise from slower elimination than absorption—mercury, lead; or the elimination may be suddenly arrested by the drug causing contraction of renal vessels, when the system has become saturated—digitalis, strychnine; or again, the intestinal contents may be quickly changed, so that from a slow we get rapid absorption; rate of excretion modifies doses—when rapid, small and oft-repeated quantities are more advantageous than larger ones, and as an outgrowth of this we have now the praiseworthy tendency of diminished dosage, as with calomel, etc.

7. *Incompatibility.*—This often changes the drug's action, producing harmless or harmful compounds, and may be of three kinds.

1. *Chemical.*—This results from double decompositions, new compounds being formed, and with the prescriber may be intentional or unintentional; from the former have liquor calcis with mercuric or mercurous chloride; zinc sulphate in solution with lead acetate; hydrochloric acid directly to potassium chlorate, etc.; in all these the new-formed product is the one desired medicinally; from the latter (unintentional) we may have glucosides (tannin, etc.) ordered with free acids, or emulsions; alkaloids with alkalies, alkaline salts, iodides or bromides; tannic and gallic acids with iron salts, alkaloids, tartar emetic, albumin, metallic oxides, gelatin; vinegars, acetic syrups, and diluted acid solutions with soluble carbonates; quinine sulphate with potassium acetate; corrosive mercuric chloride with alkalies, alkali carbonates, iodides, bromides, alkaloids, sulphides, reduced iron, silver nitrate, albumin, gelatin, tannin, etc. Any of the following with other substances must also be carefully watched, as they easily cause precipita-

tion and changes: Chlorine solutions, corrosive mercuric chloride, iodine, iodides, lead salts, iron solutions, potassium acetate, bromide, permanganate, liquor potassæ, tannic and gallic acids, dilute hydrocyanic acid, mineral acids, quinine sulphate, silver and zinc salts, tincture of guaiac, chlorates, iodates, picrates, nitrates, dichromates. The accompanying table is from Potter's *Materia Medica* and serves an admirable purpose in this connection; P. stands for precipitate.

	Alkaloidal solutions (generally).	Metallic solutions (generally).	Solutions of lead or silver.	Solutions of calcium salts.	Solutions of magnesium salts.	Solutions of albumin or gelatin.
Alkalies	P	P	P	P	P	
Tannic acid	P	P	P	..	..	P
Carbonic acid and carbonates	P	P	P	P	P	
Sulphuric acid and sulphates	.	..	P	P		
Phosphoric acid and phosphates	P	P	P	P	P	
Boric acid and borates	P	P	P			
Hydrochloric acid and chlorides	..	..	P			
Hydrobromic acid and bromides	..	..	P			
Hydriodic acid and iodides	P	..	P			
Sulphides	..	P	P			
Arsenical preparations	..	P	P			
Albumin	..	P	P			

Explosions have resulted by mixing fld. ext. uva ursi with spirit of nitrous ether; chromic or nitric acid with glycerin; potassium permanganate with glycerin; silver nitrate with creosote; silver oxide with ext. gentian in pill; potassium chlorate with glycerin and tinct. ferri chloridi; calcium chloride triturated with sulphur; oxidizing agents with sulphur, charcoal, iodine, carbolic acid, glycerin, turpentine, etc.; iodine with ammonia; potassium chlorate with catechu. Poisonous compounds result from mixing potassium chlorate with its iodide, forming in the system potassium iodate; potassium chlorate with syrup of iodide of iron, liberating in the system free iodine; dil. hydrocyanic acid or potassium cyanide with calomel, forming corrosive mercuric chloride, or mercuric bicyanide.

2. *Pharmaceutical.*—This results when substances are mixed and do not produce clear solutions owing to their different solubility in menstruums—insoluble powders or oil will not mix with water, nor will water with solutions of resins without precipitation—acid quinine solutions with liquorice solutions precipitate glycyrrhizin—alcoholic solutions with aqueous solution of chloral hydrate separate the latter on top. In all such cases it is better pharmacy to suspend the separated ingredients by the addition of a mucilage or some emulsifying agent. Under this head it is well to remember the following classes:

1. Alcoholic or resinous tinctures and fluid extracts, essential and fixed oils, copaiba each precipitate with aqueous preparations.
2. Compound infusion of cinchona with compound infusion of gentian, and this latter with infusion of wild cherry.
3. Spirit nitrous ether with strong mucilages, or tincture of guaiac.
4. Alcoholic liquids, tinctures and fluid extracts with those made with diluted alcohol; also with solution of acacia.

5. Infusions in general with metallic salts.
6. Antipyrine with alkaloids, tincture of iodine, corrosive mercuric chloride, Lugol's solution, spirit of nitrous ether, ferric salts, carbolic, hydrocyanic, tannic and nitric acids, permanganates, salicylates, chloral hydrate.
7. Pepsin with alkalies, alcoholic liquids, mineral salts, tannates, heat (100° C.; 212° F.).
8. Salicylic acid with iron compounds, alkali iodides, spirit of nitrous ether.

3. *Therapeutical.*—This results where two drugs of opposite medicinal properties are given together—the one neutralizing somewhat the other; astringents with purgatives; aconite or veratrum viride with digitalis; atropine, belladonna, hyoscyamus or stramonium with caustic alkalies, pilocarpine, physostigmine (eserine) or morphine; acids with alkalies; arsenic with hydrated ferric oxide; carbolic acid or lead salts with magnesium or sodium sulphate; cannabis indica with strychnine, picrotoxin or acids; cocaine or gelsemium with morphine; conium with strychnine, picrotoxin or stimulants; corrosive mercuric chloride with tannin or vegetable astringents; homatropine with physostigmine (eserine); opium and its alkaloids with potassium permanganate, belladonna, hyoscyamus or stramonium; oxalic acid with calcium carbonate; silver nitrate with sodium chloride; strychnine or picrotoxin with chloral hydrate and potassium bromide; tartar emetic with tannin. Sometimes physiological antagonists are purposely prescribed together, in order to have the action of the one to guard that of the other, as atropine with morphine (hypodermically).

THE CLASSIFICATIONS OF MEDICINES.

There have been many systems brought forward to facilitate the studying of drugs, and it is owing, possibly, to the number, that authors have little uniformity in the arrangement followed. It has been thought wise to outline the five most important. Of these the first and fourth alone are by their nature sufficiently comprehensive to include all organic and inorganic drugs without a single omission. The others (three) are but scientific systems applicable only to the organic medicines, and, as such, are mostly recommended by pharmaceutic and chemical investigators.

I. ARRANGEMENT BY ALPHABETIC SEQUENCE.—This is the least scientific but the most popular; in fact, it is not a true system, as no tacit relationship in any particular exists between the associated subjects, save that of initial letter in spelling, which can only possibly offer to the student the trifling advantage of lexical convenience.

II. ARRANGEMENT BY CHEMICAL CONSTITUENTS.—This serves well to familiarize students with the various groups of plants as classified from their chief constituents, furnishing the medical properties, as: volatile oil, fixed oil, glucoside, alkaloid, starch, etc. Beyond that it somewhat assists the botanist, since certain genera and even families (natural orders) occasionally have similar constituents: Labiatæ (volatile oil), Solanaceæ (mydriatic alkaloids), Convolvulaceæ (cathartic resin), etc. Its great drawbacks consist in the variability of the nature assigned these constituents from time to time through the advance of chemical science: thus, a neutral principle to-day may be an alkaloid to-morrow, and, again, nearly all drugs have more than one constituent, the most abundant often being the least active; now, which shall govern its classification is not always easy to decide.

1. *Amylaceous.*—Those containing starch as their chief medicinal principle: inula, lappa, cetraria, etc.

2. *Mucilaginous, Gummy.*—Those having considerable mucilage or gum: acacia, tragacanth, flaxseed, etc.

3. *Saccharine.*—Those containing much sugar in some form: manna, glycyrrhiza, triticum, etc.

4. *Acidulous.*—Those containing chiefly an organic acid: lemon, orange, tamarind, rubus, etc.

5. *Oleaginous.*—Those containing: (*a*) Volatile or essential oil: (1) Terpenes, $C_{10}H_{16}$: turpentine, cubeb, juniper, etc. (2) Oxygenated, $C_{10}H_{18}O$: cinnamon, anise, fennel, etc. (3) Sulphurated, $C_{12}H_{22}S_2$: mustard, asafetida, allium. (4) Nitrogenated, C_7H_6O (HCN): bitter almond, wild cherry, peach, etc. (*b*) Fixed oils (Compound ethers) which leave a permanent stain: olive, almond, castor oils, etc.

6. *Resinous.*—Those containing much resin: (*a*) Natural exudations: mastic, guaiac, benzoin. (*b*) Extracted by alcohol from resinous drugs: podophyllum, jalap, sumbul, etc.

7. *Gum-resinous.*—These contain milky exudations consisting of one or more gums and resins: (*a*) With volatile oil, ammoniac, asafetida, myrrh, etc. (*b*) Without volatile oil: gamboge, scammony, etc.

8. *Oleo-resinous.*—Those containing a volatile oil holding in solution a resin: turpentine, copaiba, Burgundy pitch, etc.

9. *Balsamic.*—Those containing a liquid, semi-liquid, or solid vegetable product composed of a resin or oleo-resin, an odorous principle, and either one or both benzoic and cinnamic acids: peru, tolu, storax, etc.

10. *Glucosidal.*—These contain an organic principle converted by mineral acids, alkalies, or ferments into glucose and an allied organic compound; they may be neutral or acid, and sometimes form salts, nearly all are soluble in alcohol: salicin, gentiopicrin, cathartic acid, tannin, etc.

11. *Neutral Principles.*—These, sometimes called bitter principles from their bitterness, are plant-constituents, either neutral or feebly acid, and, when possible, form salts with alkalies; they differ from glucosides in not splitting into glucose, and from alkaloids in not being precipitated by tannin or mercuric-potassium iodide: aloin, elaterin, picrotoxin, santonin, etc.

12. *Alkaloidal.*—These contain alkaloids composed of carbon, hydrogen and nitrogen alone, if liquid (amines), and additionally oxygen, if solid (amides); they are sometimes called vegetable alkalies, and, in

fact, are related to ammonia, as when heated with alkalies ammonia is given off; quinine, morphine, cocaine, atropine, nicotine, conine, etc.

III. ARRANGEMENT BY MORPHOLOGY AND ANATOMY.—This system is preëminently adapted for those wishing to become perfectly familiar with the general make-up of the various official plant-parts; the inner structural resemblances and differences of each group-member, as well as the relationship that each group itself sustains to its neighbors. In other words, for laboratory work it is at its best where time is afforded to make cross-sections, stainings, tests, dissections of fibro-vascular bundles, medullary sheaths, rays, etc., thereby readily distinguishing the true and genuine article from that which is false and spurious.

1. *Roots, Radices:* (*a*) Monocotyledonous: sarsaparilla. (*b*) Dicotyledonous. (1) Fleshy: stillingia, sumbul, calumba. (2) Woody: glycyrrhiza, pareira, krameria, ipecac, etc.

2. *Rhizomes, Rhizomata:* (*a*) Cryptogamous: aspidium. (*b*) Monocotyledonous. (1) Without roots: ginger, calamus, triticum. (2) With roots: veratrum, cypripedium, iris. (*c*) Dicotyledonous. (1) Without roots: sanguinaria, geranium, podophyllum. (2) With roots: valerian, arnica, serpentaria, hydrastis, spigelia, etc.

3. *Tubers and Bulbs, Tubera et Bulbi:* (*a*) Monocotyledonous tubers: colchicum, salep, Indian turnip. (*b*) Monocotyledonous tunicated bulbs: squill, garlic, etc. (*c*) Dicotyledonous tubers: jalap, aconite, corydalis.

4. *Twigs and Woods, Stipites et Ligna:* (*a*) Twigs: dulcamara, scoparius. (*b*) Woods: quassia, guaiacum, hæmatoxylon, etc.

5. *Barks, Cortices:* (*a*) Bitter and astringent: cinchona, prunus virginiana, viburnum. (*b*) Astringent: white oak, rubus, pomegranate. (*c*) Bitter, not aromatic: frangula, cascara sagrada, juglans. (*d*) Acrid or pungent: xanthoxylum, mezereum, euonymus. (*e*) Mucilaginous: ulmus. (*f*) Aromatic with oil or resin cells: cinnamon, sassafras, cascarilla, etc.

6. *Leaves and Leaflets, Folia et Foliola:* (*a*) Entire. (1) Aromatic, glandular, coriaceous: rosemary, pilocarpus, eucalyptus. (2) Not aromatic, glandular, or coriaceous: uva-ursi, senna, coca. (*b*) Toothed or crenate. (1) Coriaceous: chimaphila, buchu, eriodictyon. (2) Not coriaceous: stramonium, hyoscyamus, digitalis, etc.

7. *Herbs, Herbæ:* (*a*) Cryptogamous: chondrus, cetraria, maidenhair, etc. (*b*) Dicotyledonous. (1) Petals distinct: pulsatilla, chelidonium, scoparius. (2) Petals united: eupatorium, lobelia, peppermint (Labiatæ). (3) Petals absent: cannabis.

8. *Leafy Tops, Cacumina Summitates:* savine, red cedar, thuja, etc.

9. *Flowers and Petals, Flores et Petala:* (*a*) Unexpanded: cloves, santonica. (*b*) Expanded. (1) Polypetalous: orange, kousso, rose. (2) Gamopetalous: Compositæ, sambucus, lavender, etc.

10. *Fruits, Fructus:* (*a*) Multiple: juniper, hops, fig. (*b*) Simple. (1) Drupes: phytolacca, cubeb, black pepper, prune. (2) Berries: lemon, capsicum, colocynth. (3) Akenes: barley, lappa, cannabis.

(4) Cremocarps: Umbelliferæ. (5) Capsules: cassia fistula, cardamom, vanilla. (6) Parts of fruit: lemon, tamarind, etc.

11. *Seeds, Semina:* (*a*) Monocotyledonous (albuminous): sabadilla, colchicum, areca, etc. (*b*) Dicotyledonous. (1) Exalbuminous: almond, pumpkin, physostigma, mustard. (2) Albuminous: nux vomica, staphisagria, linseed, nutmeg, stramonium.

12. *Drugs with Cellular Structure:* (*a*) Not farinaceous: nutgall, ergot, mace, saffron, lupulin, lycopodium. (*b*) Farinaceous: starch, tapioca, barley, etc.

13. *Drugs without Cellular Structure:* (*a*) Extracts and inspissated juices, *Extracta et succi inspissati.* (1) Wholly or partially soluble in water or alcohol: guarana, opium, lactucarium, aloes, extract of glycyrrhiza, extract of hæmatoxylon, catechu, kino. (2) Insoluble in water or alcohol: gutta percha, elastica, etc. (*b*) Sugars, *Sacchara:* sugar, manna, honey. (*c*) Gums, *Gummata:* acacia, tragacanth, etc. (*d*) Gum-resins, *Gummi resinæ.* (1) With volatile oil: asafetida, ammoniac, myrrh. (2) Without volatile oil: gamboge, scammony. (*e*) Resins, *Resinæ.* (1) Without benzoic or cinnamic acid: elaterium, mastic, resin, guaiac. (2) With benzoic and cinnamic acids: benzoin, dragon's blood. (*f*) Balsams and oleoresins, *Balsama et oleoresinæ.* (1) Without benzoic or cinnamic acid: copaiba turpentine, Burgundy pitch, tar. (2) With benzoic or cinnamic acid: peru, tolu, storax. (*g*) Volatile oils and camphors, *Olea volatilia et camphoræ.* (1) Volatile oils—arranged in sequence of families (natural orders), containing a volatile portion, elæopten, and a less volatile portion, stearopten or camphor: terpenes, oxygenated, nitrogenated, sulphurated. (2) Camphors: camphor, thymol, menthol, etc. (*h*) Fixed oils and waxes, *Olea pinguia et ceræ.* (1) Liquid fats: almond, olive, linseed, cod-liver, croton, castor oils. (2) Solid fats: oil of theobroma, lard suet. (3) Waxes: spermaceti, wax.

14. *Drugs of Animal Origin:* (*a*) Animals: cantharides, cochineal, leech. (*b*) Animal products, tissues, secretions: eggs, isinglass, musk, pepsin, ox-gall. (*c*) Calcareous skeletons and concretions: coral, cuttlefish bone, oyster-shell.

IV. ARRANGEMENT BY THERAPEUTIC EFFECT.—This is possibly the easiest and most useful to the average physician. In a way it is scientific, but since many medicines have more than one property, with the same or varying dosage, it often becomes more or less confusing as to the group to which such should be assigned; then again this system has become somewhat flexible and to lack perfect uniformity through the preferences of those giving it prior sanction. Thus all drugs may be placed into a dozen general classes, each with many subdivisions: those acting on protoplasm, muscle, nerves, spinal cord, brain, special sense, reproduction, circulation, digestive system, tissue changes, excretion, generative system; or with no less equity the same number may be retained, but in substance somewhat modified, thus: drugs acting upon organisms, blood, cardiac mechanism, vessels, skin, urinary system, bodily heat, respiration, digestive apparatus, nervous and muscular systems, organs of generation, metabolism ; or again the general classes may be altogether omitted, simply using the names descriptive of the various therapeutic effects, arranged alphabetically, or according to real or fancied importance. From its universal favor and the usage of its terms throughout this work we give yet another modification which has some advantages.

I. AGENTS PROMOTING CONSTRUCTIVE METABOLISM (METAMORPHOSIS).

1. *Restoratives* (L. *restaurare*, to restore).—These restore or renew strength or vitality ; (*a*) Foods, Aliments, which maintain some vital process, or renew some structural material, while medicines can only modify some vital action. They are derived from the vegetable, animal and mineral kingdoms, and in nature are recognized as being either *oxidizable*—heat-producing and force-forming : carbon compounds, fat, sugar, starch, gum, etc. ; *nitrogenous*—flesh-forming : albumin, casein, fibrin, etc. ; *unoxidizable or incombustible :* metallic salts, water, etc. ; (*b*) Digestive ferments, which are animal and vegetable substances for aiding digestion when the normal alimentary secretions are inefficient : pepsin, pancreatin, papain, ingluvin, diastase, etc. ; (*c*) Digestive acids, which check the production of glands having acid secretions, but increase those having alkaline secretions : diluted hydrochloric, nitric, sulphuric, nitro-hydrochloric, lactic, phosphoric, etc. ; (*d*) Fats and fatty oils, which form the molecular basis of the chyle, are indeed necessary for the digestion of nitrogenous food, and by oxidation become the chief producers of vital force and heat : cod-liver, cotton-seed, linseed, olive, sweet-almond, theobroma ; (*e*) Hæmatics (Gr, *ἁιματικός*, of the blood), which increase the amount of hæmatin in the blood, improving its quality by enriching the red corpuscles : salts of iron, manganese, chalybeate waters, etc. ; (*f*) Tonics (Gr. *τονικός*, tone), which improve the tone of specific tissues, restoring energy and strength to the entire debilitated system, by imperceptibly stimulating vital functions. (1) Mineral : phosphorus, phosphates, phosphites, bismuth, arsenic, etc. (2) Vegetable ; (*a*) Simple Stomachic Bitters, containing a bitter principle : gentian, calumba, quassia, chirata, calendula ; (*b*) Aromatic Bitters, containing a volatile oil, bitter principle, resin, tannin : serpentaria, cascarilla, wild cherry, eupatorium, anthemis, matricaria, absinthium.

2. *Antiperiodics* (L. *anti*, opposed to, + *period*).—These prevent recurrence of, or modify certain periodic febrile diseases by arresting further development in the blood of successive crops of pathogenic organisms causing the disorder : cinchona alkaloids, eucalyptus, salicin, arsenic, etc.

3. *Antipyretics, Febrifuges* (Gr. *ἀντί*, against, + *πυρετός*, fever ; L. *febris*, fever, + *fugare*, to put to flight).—These reduce abnormally high body-temperature, either by decreasing heat-production, or increasing heat-loss ; the former condition being affected by (1) lessen-

ing tissue change, (2) reducing circulation ; the latter by (1) dilating the skin-vessels, thereby increasing radiation, (2) causing perspiration and its evaporation, (3) abstracting body-heat, through cold applications : cinchona alkaloids, acetanilid, antipyrine, phenacetin, salol, carbolic acid, creosote, aconite, veratrum viride, cold bath, pack or sponging, purgation, venesection.

4. *Antiphlogistics* (Gr. *ἀντί*, against, + *φλογιστός*, burning).—These reduce inflammation of serous membranes : mercury, opium, etc.; respiratory tract and organs : aconite, tartar emetic, etc.; and puerperal metritis : veratrum viride, ergot, cold, purgation, etc.

II. Agents Promoting Destructive Metabolism (Metamorphosis)—Increase Waste.

5. *Semi-alteratives*, *Alkalies*.—These stimulate acid and check alkaline secretions when placed in contact with the mouths of the gland-ducts producing them, and may be (1) Direct, which lessen the stomach's acidity. (2) Indirect, which have only a remote effect, being oxidized in the blood, and excreted as carbonates in the urine, thereby lessening its acidity : potassium carbonate and bicarbonate, liquor potassæ, sodium carbonate and bicarbonate, liquor sodæ, ammonium, lithium and magnesium carbonates, magnesia, lime water, calcium carbonate, aromatic spirit of ammonia, potassium and sodium acetates, potassium, sodium and lithium citrates, potassium tartrate and bitartrate, vegetable acids.

6. *Alteratives*.—These alter or change morbid conditions, by furthering metabolism, and modify nutritive processes : iodine, iodides, arsenic, antimony, mercury, sulphur, sulphides, sulphites, phosphorus, sarsaparilla, guaiacum, mezereum, stillingia, colchicum, xanthoxylum, hydrastis, phytolacca, sassafras, cod-liver oil. Alteratives are also called *Resolvents* and *Discutients* (L. *resolvere*, to resolve ; *discutere*, to disperse) from the fact that they promote absorption of inflammatory deposits, either by stimulating the lymphatic glands, or promoting the imbibition of medicinal or nutritive material in the system.

7. *Astringents* (L. *ad*, to, + *stringere*, to bind fast).—These contract muscular fibre, by direct irritation (local), and condense other tissues, by precipitating the albumin and gelatin (remote). 1. Mineral : salts of silver, copper, lead, zinc, bismuth and aluminum ; 2. Vegetable : tannic and gallic acid, nutgall, white oak, geranium, castanea, catechu, kino, krameria, hæmatoxylon, hamamelis, red and pale rose, uva-ursi.

III. Agents Promoting the Destruction of Microbes, Parasites, etc.

8. *Antizymotics* (Gr. *ἀντί*, against, + *ζυμωτικός*, fermentation).—These arrest fermentation dependent upon organic ferments (enzymes): diastase, pepsin, ptyalin ; or upon organized ferments : yeast, bacteria, etc.; (*a*) *Antiseptics* (Gr. *ἀντί*, against, + *σηπτικός*, rottening), which prevent

or retard septic decomposition, by killing the bacilli producing it, or by arresting their development: corrosive mercuric chloride, hydrogen peroxide, potassium permanganate, sulphurous acid, carbolic acid, creosote, lysol, thymol, eucalyptol, menthol, sodium borate, boracic acid, chlorine, zinc chloride; (*b*) *Disinfectants* (L. *dis*, *di*, in two, apart, from, + *infection*), which destroy specific germs communicating disease (mostly microbes), by (1) acting as oxidizants, (2) combining with albumin, (3) chemically combining to form substitution-compounds, (4) arresting molecular changes, (5) altering the reaction of the media containing the germs: heat (110–121° C.; 230–250° F.), lime, chlorinated lime and soda, ferrous sulphate, zinc chloride, potassium permanganate and dichromate, sulphurous and nitrous acid, sulphur dioxide, formaldehyde, air, water, fire; (*c*) *Deodorants* (L. *de*, from, + *odoran*(*t*)*s*, smelling), which destroy foul odors. These may be volatile (oxidizing and deoxidizing) agents, that act chemically on obnoxious gases: chlorine, sulphur dioxide, hydrogen dioxide, formalin; or non-volatile (chiefly absorbents) agents that act by condensing and decomposing the effluvia: potassium permanganate, charcoal, earth, lime, ferrous sulphate, etc.

9. *Parasiticides, Germicides* (Gr. *παρά*, besides, upon, + *σιτεῖν*, to feed; L. *parasitus* + *cædere*, to kill).—These kill animal and vegetable parasites existing upon the system, being usually applied in the form of lotions, solutions, washes, ointments and oleates: staphisagria, corrosive mercuric chloride, mercuric nitrate and oxide, ammoniated mercury, sulphur, sulphur iodide, carbolic acid, iodoform, aristol, resorcin, naphtalin, naphtol, creosote, guaiacol.

IV. Agents Acting on the Nervous System (Neurotics, Nervines).

10. *Cerebral Excitants, Stimulants, Antispasmodics* (L. *stimulus*, a goad, excitant; *anti*, against, + Gr. *σπασμός*, a spasm).—These increase the functional activity of the brain, without causing any subsequent depression or suspension of the cerebral functions: valerian, asafetida, sumbul, musk, camphor, guarana, caffeine (theine), alcohol.

11. *Cerebral Depressants, Sedatives* (L. *sedare*, to allay).—These lower or suspend the higher brain functions after a preliminary stage of excitement; (*a*) *Narcotics* (Gr. *νάρκη*, numbness, stupor), which at first excite and stimulate all the body functions, then cause profound sleep, stupor, coma, insensibility, and death by paralyzing the medulla-centres governing respiration and other vital functions: opium, morphine, cannabis indica, lactucarium, cimicifuga; (*b*) *Hypnotics, Soporifics, Somnificants* (Gr. *ὕπνος*, sleep; L. *sopor*, heavy sleep, *somnus*, sleep, + *facere*, to make), which produce sleep, leaving undisturbed the normal relationship of the mental faculties to the external world; in a broad sense these include narcotics and anæsthetics: chloral hydrate, sulphonal, trional, paraldehyde, chloralamide, urethane, potassium, sodium and ammonium bromides; (*c*) *Anodynes, Analgesics* (Gr. *ἀν*, not, + *ὀδύνη*, *ἄλγος*, pain, without pain, cures pain), which relieve pain by either de-

pressing sensory centres or impairing nerve-fibre conductility: opium, morphine, belladonna, hyoscyamus, stramonium, coca, cocaine, hops, antipyrine, acetanilid, phenacetin; (*d*) *Anæsthetics* (Gr. *ὰν*, not, + *ὰισθητός*, sensible, insensible effect produced), which reduce sensory nerve-functions until they cannot receive or conduct sensation; some directly depress the skin's end-organs, others impair the sensory nerve conductility, others reduce local circulation; these are mostly volatile substances, whose vapor when inhaled sufficiently cause complete unconsciousness, loss of sensation and motion: anodynes only diminish, while anæsthetics temporarily destroy skin and mucous membrane sensibility: ether, chloroform, nitrous oxide, ethyl bromide, methylene bichloride.

12. *Motor Excitants* (*Excito-motors, Spinants*).—These increase functional activity of the motor apparatus and spinal cord, causing in large doses, disturbances of motility, increased reflex excitability, and tetanic convulsions, finally paralysis from over-stimulation: nux vomica, strychnine, ignatia, picrotoxin, electricity.

13. *Motor Depressants* (*Depresso-motors*).—These lower functional activity of the motor apparatus and spinal cord, in large doses directly paralyzing them: physostigma, conium, gelsemium, potassium, sodium, ammonium and lithium bromides, amyl nitrite, nitroglycerin, lobelia, alcohol, ether, chloroform.

14. *Mydriatics* (Gr. *μυδρίασις*, enlarged pupil).—These dilate the pupil; some act locally, others systemically, causing paralysis of the ciliary muscle: atropine, homatropine, hyoscyamine, daturine, duboisine, cocaine.

15. *Myotics* (Gr. *μύειν*, to shut).—These contract the pupil by stimulating the circular muscular fibres of the iris, and by contracting the ciliary muscle so that the eye is accommodated only for near objects: physostigmine, pilocarpine, morphine, anæsthetics (at first), muscarine.

V. AGENTS ACTING ON THE RESPIRATORY SYSTEM (RESPIRATION).

16. *Respiratory Stimulants*.—These exalt the functions of the respiratory centre, in the medulla, affording deeper and quicker breathing: strychnine, atropine, digitalis, quebracho, apomorphine, duboisine, emetine, opium (small doses).

17. *Respiratory Sedatives* (*Depressants*).—These lower the respiratory centre's activity, affording shallow and slow respirations: opium, physostigma, gelsemium, aconite, veratrum viride, conium, muscarine, hydrocyanic acid.

18. *Pulmonary Sedatives* (Gr. *πλεύμων*, *πνεύμων*, lung, L. *pulmo* (*narius*), pertaining to or affecting the lungs.)—These lessen the irritability of the respiratory nerves or centre, thereby diminish cough and dyspnœa. Some directly depress the centre, others remove irritating substances from the passages, others lessen local congestion, others lower the excitability of the vagus end-organs and afferent filaments of the lungs and respiratory tract: opium, morphine, codeine, hydrocyanic acid, belladonna.

19. *Sternutatories*, *Errhines* (L. *sternutare*, to sneeze; Gr. ἐν, in, + ῥίν, the nose).—The former cause sneezing, the latter increase nasal secretion, when applied to mucous membrane in powdered form: ipecac, quillaja, ammonia, cubeb, etc.

20. *Ciliary Excitants* (L. *cilium*, an eyelid, hair-like process).—These, when dissolved in the mouth, promote bronchial mucus expectoration through reflex excitation of the bronchial and tracheal cilia: acacia, ammonium and sodium chlorides, potassium chlorate.

21. *Expectorants* (L. *ex*, out of, + *pector*, the breast).—These change the broncho-pulmonary mucous membrane secretion, promoting its expulsion; (*a*) Nauseating (Sedative), which, in large doses, vomit, thereby acting mechanically in expelling the mucus, and, in small doses, increase osmosis from the inflamed mucous membrane; they may increase secretion and lower blood-pressure: tartar emetic, ipecac, apomorphine, lobelia, pilocarpus; (*b*) Stimulating, which stimulate the bronchial mucous membrane that eliminates them, altering the secretion and facilitating expectoration: senega, squill, ammonium carbonate and chloride, benzoin, balsams of Peru and Tolu, tar, turpentine, garlic, onion, liquorice, saccharine substances, ammoniac.

VI. AGENTS ACTING ON THE CIRCULATORY SYSTEM (CIRCULATION).

22. *Cardiac Stimulants* (*Tonics;* L. *cardiacus*, Gr. καρδία, heart).—These stimulate the cardiac muscle, slowing and strengthening its contractions; excessive quantities may cause sudden death by syncope: digitalis, strophanthus, scoparius, convallaria, cimicifuga, nitroglycerin, nitrites, alcohol, ether, ammonia, heat, galvanism, chloroform.

23. *Cardiac Depressants* (*Sedatives*).—These lessen the force and frequency of the heart's action, controlling its overaction and palpitation; especially do they slow the pulse in sthenic fevers due to local inflammation: aconite, veratrum viride, tartar emetic, senega, pilocarpine, hydrocyanic acid, emetine, quinine (full doses), pulsatilla, grindelia, cold.

VII. AGENTS ACTING ON THE DIGESTIVE SYSTEM (DIGESTION).

24. *Sialogogues* (Gr. σίαλον, saliva, + ἀγωγός, drawing forth).—These promote the secretion and flow of saliva and buccal mucus; (*a*) Topical, which act through reflex irritation, caused by taking something into the mouth: capsicum, ginger, cubeb, mustard, tobacco, pyrethrum, horse-radish, alkalies; (*b*) General, which act through systemic influence on the glands or their secretory nerves during their elimination: pilocarpus, mercurials, antimonials, iodine compounds, physostigma.

25. *Refrigerants* (L. *refrigerare*, to cool).—These allay thirst, giving the sensation of coolness: vegetable and mineral acids (diluted), fruit juices, ice water, effervescing drinks, diaphoretics.

26. *Dental Anodynes.*—These are used locally in toothache due to caries, thus exposing a nerve filament: aconite, cocaine, opium, morphine, carbolic acid, creosote, oil of cloves and peppermint, chloral hydrate.

VIII. AGENTS ACTING ON THE EXCRETORY SYSTEM (EXCRETION).

27. *Carminatives, Aromatics* (L. *carminativus*, expel wind).—These expel gases from the stomach and intestines by increasing peristalsis, stimulating the circulation, and relaxing the cardiac and pyloric orifices; also act as diffusible stimulants to the body and mind: cardamom, capsicum, ginger, peppermint, spearmint, cinnamon, nutmeg, lavender, calamus, orange, anise, caraway, coriander, fennel, pimenta, pepper, mustard, cloves, asafetida, and volatile oil of each.

28. *Emetics* (Gr. ἔμετος, vomiting).—These cause vomiting; (*a*) Local, which, by reflex action, irritate the end-organs of the gastric, pharyngeal or œsophageal nerves: zinc and copper sulphates, mercury subsulphate, alum, mustard, tepid water; (*b*) Systemic (General), which act by directly stimulating the vomiting-centres through circulation: ipecac, apomorphine, tartar emetic, senega, squill, lobelia, sanguinaria, compound syrup of squill.

29. *Antiemetics.*—These lessen nausea and vomiting: (*a*) Local, which produce a sedative action on the end-organs of the gastric nerves: ice, carbolic acid, bismuth subnitrate and subcarbonate, cerium oxalate, creosote, small doses of calomel or ipecac, hot water, opium, cocaine; (*b*) General, which act by reducing the irritability of the vomiting-centre in the medulla: opium, bromides, morphine, codeine, chloral hydrate, alcohol, amyl nitrite, food, brandy.

30. *Cathartics, Purgatives* (Gr. *καθαρτικός*, cleansing; L. *purgare*, to cleanse).—These increase or hasten intestinal evacuations; (*a*) *Aperients, Laxatives* (L. *aperiere*, to open; *laxare*, to loose), which excite moderate peristalsis, giving soft movements without irritation: magnesia, manna, sulphur, tamarind, almond and olive oils, figs, prunes, oatmeal; (*b*) *Simple Purgatives*, which cause active peristalsis, and stimulate the intestinal gland's secretion, giving one or more copious, semi-fluid movements accompanied by some irritation and griping: aloes, calomel, castor oil, cascara sagrada, rhubarb, senna, small doses of salines, drastics, cholagogues; (*c*) *Saline Purgatives*, which stimulate the intestinal glands, increase peristalsis and osmosis, causing watery stools: magnesium sulphate and citrate, potassium sulphate, tartrate and bitartrate, sodium sulphate, phosphate and chloride, potassium and sodium tartrate: (*d*) *Drastic Purgatives* (Gr. δράω, to act). These are often called simply cathartics, and act more intensely than the preceding, causing violent peristalsis, watery stools, griping, tenesmus, borborygmus, mucous membrane irritation, and exosmosis of serum; large doses become irritant poisons: colocynth, jalap, gamboge, scammony, croton oil, (*e*) *Hydragogue Purgatives* (Gr. ὕδωρ, water, + ἀγωγός, leading forth), which remove much water from the vessels: cro-

ton oil, elaterium, gamboge, potassium bitartrate, large doses of salines and drastics; (*f*) *Cholagogue Purgatives* (Gr. χολή, bile, + —), which stimulate bile flow, causing free purgation of green-colored (bilious) and liquid stools: mercurials, aloes, rhubarb, podophyllin, euonymin, iridin, leptandrin.

31. *Diuretics* (Gr. δία, through, + οὐρεῖν, to urinate).—These increase renal secretion, either by raising the local or general blood-pressure, thereby increasing renal circulation (blood-supply), or by stimulating the secreting cells or nerves of the kidneys, or by washing out the kidneys with much water taken at night or early morning; (*a*) Refrigerant, which excite the renal epithelium, producing a hyperæmic condition of the kidneys and an increased amount of water in the urine; they depress the heart and general circulation: potassium acetate, citrate and bitartrate, ammonium and sodium acetates, lithium carbonate and citrate, magnesium citrate and sulphate, water, milk, cold applications; (*b*) Hydragogue, which largely increase the water of the urine, owing to raising arterial pressure, locally or generally: digitalis, strophanthus, spirit of nitrous ether, nitrites, squill, cimicifuga, scoparius; (*c*) Stimulant (blennorrhetics), which act directly upon the renal tissue, by which they are to a great extent eliminated from the body: buchu, copaiba, cubeb, matico, pareira, uva-ursi, savine, juniper, chimaphila, taraxacum, cantharides, turpentine, oil of santal, corn silk, apocynum.

32. *Antilithics, Lithotriptics* (Gr. ἀντί, against, + λίθος, stone, + τρίβειν, to rub).—The former prevent urinary and biliary concretions forming in the excretory passages, the latter dissolve them when formed; biliary calculi: alkaline waters, turpentine, etc.; uric acid or urates: alkaline salts, magnesium citro-borate, etc.; calcium oxalate: acids, carbonated waters, etc.; phosphatic calculi: ammonium benzoate, nitric acid, etc.

33. *Diaphoretics, Sudorifics* (Gr. δία, through, + φορεῖν, to carry; L. *sudor*, sweat, + *facere*, to make).—These increase the action of the skin, causing sweat-secretion; when so profuse as to stand on the surface in beads they are called sudorifics; (*a*) Simple, which enter circulation and stimulate the sudoriferous glands, by which they are eliminated: pilocarpus, ammonium acetate and citrate, sarsaparilla, guaiacum, mezereum, sassafras, senega, serpentaria, salicylates; (*b*) Nauseating, which relax and dilate the superficial capillaries: ipecac, tartar emetic, opium, Dover's powder, alcohol, ether, spirit of nitrous ether, lobelia, tobacco, vapor and Turkish bath, wet pack, hot drinks; (*c*) Refrigerant, which reduce circulation by acting on the sweat-centres in the spine and medulla: potassium citrate, aconite, veratrum viride, tobacco, lobelia, pilocarpus, spirit of nitrous ether, opium.

34. *Antihydrotics, Anhydrotics* (Gr. ἀντί, against, ἀν, not, + ἱδρώς, sweat).—These check perspiration by reducing action of sweat-glands, or excitability of sweat-centres, or the circulation in the skin: belladonna, chloralamide, muscarine, pilocarpine, strychnine, quinine, etc.

35. *Anthelmintics* (Gr. ἀντί, against, + ἕλμινθ, a worm).—These de-

stroy (*Vermicides*, L. *vermis*, worm, + *cædere*, to kill) or expel (*Vermifuges*, L. *vermis*, worm, + *fugare*, to put to flight) intestinal worms. Vermifuges: castor oil, jalap, scammony. Vermicides, for: (*a*) Thread worms (*Oxyuris vermicularis*): vegetable astringents, alum, iron sulphate, aloes, tannin, lime water, quassia, all by enema; (*b*) Round worms (*Ascaris lumbricoides*): santonin, spigelia, chenopodium, each in combination with either calomel, castor oil, senna or compound jalap powder; (*c*) Tape-worms (*Tænia solium* +) *Tænifuges:* aspidium, kamala, kousso, pomegranate, pumpkin seed, turpentine.

IX. AGENTS ACTING UPON THE REPRODUCTIVE SYSTEM (GENERATION).

36. *Emmenagogues* (Gr. ἔμμηνος, monthly, + ἀγωγός, leading forth).—These restore the menstrual function, either by stimulating directly the uterine muscular fibre, or indirectly enriching the blood, thus toning up the nervous system: (*a*) Direct, which act locally on the uterus: ergot, rue, tansy, savine, cantharides, myrrh, guaiacum, apiol, hedeoma, cimicifuga, caulophyllum, pulsatilla, potassium permanganate; (*b*) Indirect, which act generally on the system: iron, manganese, quinine, strychnine, aloetic purgatives, tonics, hot hip baths, cod-liver oil.

37. *Ecbolics*, *Oxytocics* (Gr. ἐκ, out of, + βάλλειν, to throw out; ὀξύς, quick, + τόκος, birth).—These stimulate the muscular fibres of the gravid uterus to contraction, thus causing premature birth or abortion: ergot, cottonroot bark, savine, hydrastis, potassium permanganate, oils of rue, tansy and pennyroyal.

38. *Aphrodisiacs* (Gr. Ἀφροδίτη, Venus, Greek goddess of love, venereal).—These stimulate sexual appetite and power by acting reflexly or directly upon the cerebral or spinal genital centre: damiana, phosphorus, cantharides, tonics, ergot, meat diet, strychnine, Indian cannabis, alcohol.

39. *Anaphrodisiacs* (Gr. ἀν, not, + —).—These lessen sexual functions and appetite, by diminishing excitability of the nerves of the genital organs, also by depressing the genital centres in the brain and spine, and by decreasing local circulation: bromides, camphor, opium, tobacco, purgation, venesection, cold baths, ice, vegetable diet, cocaine, belladonna.

40. *Galactagogues* (Gr. γάλα, milk, + ἄγειν, ἀγωγός, drawing or leading forth).—These increase lacteal secretion: pilocarpus, ricinus (leaves locally), thea (internally with alcohol, beer, porter), etc.

X. AGENTS ACTING ON THE CUTANEOUS SYSTEM (SKIN).

41. *Irritants*, *Counter-irritants.*—These when applied to the skin cause vascular excitement; when used to produce reflex influence on remote parts are called counter-irritants: (*a*) *Rubefacients* (L. *rubere*, to be red, + *facere*, to make), which produce temporary redness and skin congestion; if left on too long, may cause exudation between the

cuticle and true skin (vesicants), or may destroy the tissue, forming a slough (escharotics), or may cause muscular atrophy: mustard, capsicum, mezereum, iodine, menthol, ammonia, arnica, volatile oils (turpentine, cajuput, etc.), hot water, friction; (*b*) *Vesicants, Epispastics, Blisters* (L. *vesica*, a blister; Gr. *ἐπί*, upon, + *σπᾶν*, to draw), which produce much inflammation of the skin and effusion of serum between the epidermis and derma: cantharides, mezereum, iodine, rhus toxicodendron, glacial acetic acid, volatile oil of mustard, steam, boiling water, ammonia vapor; (*c*) *Pustulants* (L. *pustulare*, to blister), which cause pustules, and affect isolated parts of the skin, as orifices of sudoriferous glands: croton oil, tartar emetic, silver nitrate; (*d*) *Escharotics, Caustics* (Gr. *ἐσχάρα*, a scar), which destroy tissue when applied, by abstracting its water, or by combining with the albumin of the skin, or by corrosive deoxidation of the tissues, thus causing a slough: mineral acids, carbolic acid, chromic acid, lime, caustic potash and soda, dried alum, silver nitrate, zinc chloride, copper sulphate, corrosive mercuric chloride, mercuric oxide and nitrate, bromine, high heat, electric cautery, boiling water, arsenous acid.

42. *Styptics, Hæmostatics* (L. *stypticus*, contracting; Gr. *αἷμα*, blood, + *στατικός*, to stop).—These arrest hemorrhages; the former being used locally, the latter internally. Some act mechanically, by closing the mouths of the bleeding vessels with a blood-clot, others contract the vessels, thus checking the blood-flow: (1) acids, alum, collodion, ferric chloride, and sulphate, silver nitrate, matico, tannin, lead acetate, zinc sulphate, vegetable astringents, cold (locally), electric cautery; (2) ergot, gallic acid, matico, lead acetate, diluted sulphuric acid, hamamelis, oil of turpentine, heat (locally).

43. *Emollients* (L. *emollire*, to soften).—These soften and relax the tissues, when applied locally, diminish the tension and pressure on the nerves, dilate the vessels and protect inflamed surfaces: poultices, fatty oils, lard, spermaceti, glycerin, petroleum, starch, soap liniment, cacao-butter.

44. *Demulcents* (L. *demulcere*, to soothe).—These are usually mucilaginous or oleaginous, intended for soothing parts to which applied; they are generally restricted to mucous membranes, and emollients to the skin: acacia, cetraria, starch, flaxseed, liquorice, gelatin, honey, althæa, egg-white, tragacanth, olive and other bland oils.

45. *Protectives.*—These are mechanical coverings to protect various injured parts from the air, water, friction, etc.: collodion, plasters, etc.

V. ARRANGEMENT BY NATURAL AFFINITIES (BOTANICAL).—This system is the one adopted throughout this work. It is of all others the most scientific by which plants can be studied, and, as the official portions of vegetable drugs are but parts of the whole, it seems only natural that the parental source should furnish the basis of classification for these medicinal parts. Every one knows that there are greater similarities and dissimilarities between some plants than there are between others; that this likewise applies to animals. Scientists, taking advantage of this fact, have for several centuries been trying to form groups of plants, each to contain only those possessing, in common, certain marks of resemblance, and so naming the same when possible, to typify the strongest characteristic. Early botanists were content with one point of agreement, but they even differed as to what plant organ, above all others, should be accepted to furnish this point, hence the basis of a system. Cæsalpinus (1519–1603) selected the fruit, the globular furnishing one class, the flat another, etc. Tournefort (1656–1708) took the flower, restricting himself to the modification and arrangement of the corolla, the cup-shaped being one class, the bell-shaped another, etc. Linnæus (1707–1778) went a step further and founded classes and orders upon the position, number, and relative lengths of the stamens and pistils, giving us the Linnæan, artificial, or sexual system of plants. This worked very well until cultivation, climatic differences, etc., changed the number of stamens and pistils. So far no one had taken into consideration the plant's entirety. It was to John Ray (1628–1705), often called the "father of English natural history," that we owe the conception of a broader and more natural system; but it was Jussieu (1748–1836) who, embodying the grand features of both Ray and Tournefort, laid the permanent foundation of the true natural system which, somewhat modified, has come down to us. The very foundation of this system necessitates the faithful consideration of the similarities in form, structure, growth, habits, functions, thereby involving the idea of "affinity in essential organs." These understood, we can arrange the entire vegetable kingdom into allied groups of a scaling grade, dependent upon their whole make-up, thus placing each family (order), genus, and species next to those it most resembles in all respects.

Families or *Natural Orders*.—Of these there are about 280; they are the broader groups, and each comprises plants resembling one another in some strong particular, which applies to them generally as a class; this characteristic is usually taken from one of the reproductive organs (flowers, fruit, seed), and is so striking as to be noticeable by the inexperienced: Leguminosæ (fruit in legumes), Umbelliferæ (flowers in umbels), Compositæ (flowers compound), Labiatæ (corolla two-lipped), Cupuliferæ (fruit in cupule), Guttiferæ (juice exudes in drops), Coniferæ (fruit in cones), Cruciferæ (petals arranged like maltese cross), etc.

Genus, *Genera*.—Of these there are about 10,000; they are more restricted groups, and go to compose the families or natural orders. This name corresponds to the family, surname or last name of persons, Brown, Smith, Jones; it is a noun, and, like the family (ordinal) name, begins with a capital. These are grouped also according to some certain but more restricted characteristic taken from reproductive organs; hence a genus is a collection of species resembling one another in the structure and general characters of the organs of reproduction, or in reproductive processes, methods of fructification, pollination, etc. Plants of the same genus are expected to be on the same numerical plan, and to have flowers, constituents, and medical properties somewhat similar.

Species, Species.—Of these there are about 200,000; they are the most restricted permanent groups and make up the various genera. This name corresponds to the baptismal or first name of persons, James, John, William ; it is usually an adjective agreeing in case and gender with generic name, and, as such, should begin with a small letter. These are grouped according to some certain but still more restricted characteristics taken usually from the vegetative organs (root, stem, leaves), as color, proportion, shape, surface, duration, division, etc.; hence, species is a succession of individuals which reproduces and perpetuates itself. The last two names, generic and specific, when taken together, constitute the plant's name, *i. e.*, botanical source or origin, and consequently every plant (and animal) is thus always designated.

There are two scientific methods (with their many modifications) of arranging each family (order), genus and species toward its nearest neighbor. Thus we can follow Jussieu's sequence, beginning with the cellular, flowerless, or lowest plant life (Algæ), advancing to those of vascular structure, with apologetic, imperfect, or incomplete floral parts, always having each to follow in the ascending scale, finally reaching those producing as then understood the most perfect, complete and typical flowers (Ranunculaceæ). De Candolle (1778–1841) greatly innovated this system, but chiefly in reversing the arrangement, placing the most highly organized plants, or flower producers, first in order, and each lower one in. a descending succession. This would seem the most unnatural, as the order of development in nature surely suggests the evolution from forms more simple to those more complex, and not the converse. In spite of this, however, it has been universally accepted for the past half century, being strongly indorsed and followed by many of the world's greatest botanists, including Bentley, Trimen, Hanbury, Gray, Balfour, Bentham, Hooker, etc., and is best enunciated by Bentham and Hooker in their "Genera Plantarum."

The former plan, being the most rational, has always continued to have supporters, and during the past two decades has been systematically and thoroughly studied, especially in Germany, with more than ordinary zeal and results. Such scholors as Eichler, Engler, Prantl, Thomé, Potonié, Richter, Flückiger, Köhler, Strasburger, Schenck, Schimper, etc., have instituted many changes, and, although beginning with the most primitive plant-life and finally ending with those bearing most complex flowers (Compositæ), have succeeded in evolving the system in a form much more consistent and in harmony with the modern scientific thought and the general plant nature. As such it is best enunciated by Engler and Prantl in their "Die Natürlichen Pflanzenfamilien," and as this is the sequence that must necessarily come into future favor, it has been thought wise, in the main, to adhere to it in this work, giving thereto the following synopsis :

SUB-KINGDOM I. THALLOPHYT(ES)-A.

CLASS ALGÆ.

1. *Gigartinaceæ.*—Distinguished by being parenchymatous plants, growing in fresh or salt water, or moist places, red, purple or violet hue, less commonly green or blackish; composed of 250 species. *Chondrus, Gigartina.*

CLASS FUNGI.

2. *Hypocreaceæ.*—Distinguished by rarely containing chlorophyll, saprophytes, parasites, either soft, fibrous, gelatinous, fleshy, leathery, horny, mycelium inconspicuous, often producing a dense homogeneous tissue; composed of 200 species. *Claviceps.*

CLASS LICHENES.

3. *Parmeliaceæ.*—Distinguished by being perennials, resembling Algæ and Fungi, gray, brown or green color (chlorophyll), intermediate between fruticose and foliaceous Lichens, on barks of trees, etc.; composed of 300 species. *Cetraria.*

SUB-KINGDOM II. PTERIDOPHYT(ES)-A.

CLASS FILICINÆ.

4. *Polypodiaceæ.*—Distinguished by leaves being fronds, large, spores one kind, in cases (sporangia) on under surface or margin, circinate in vernation, stems usually prostrate, subterranean; composed of 70 genera, 3,000 species. *Dryopteris.*

CLASS LYCOPODINÆ.

5. *Lycopodiaceæ.*—Distinguished by yellow spores, low, usually moss-like evergreens, stems much branched, elongated, sporangia 1–3-celled, solitary in the axils of leaves, or on their upper surface; composed of 125 species. *Lycopodium.*

SUB-KINGDOM III. SPERMATOPHYT(ES)-A.

CLASS GYMNOSPERMÆ.

6. *Pinaceæ* (*Coniferæ*).—Distinguished as resinous, evergreen trees, shrubs, flowers unisexual, no perianth, staminate—catkins, pistillate—scaly aments, becoming cones, sepals naked (2), leaves needle-shaped; composed of 25 genera, 240 species. *Pinus, Abies, Juniperus.*

CLASS ANGIOSPERMÆ.

SUB-CLASS Monocotyledones.

7. *Gramin(ac)eæ.*—Distinguished by glumaceous flowers, paleæ two in each, stamens hypogynous, stems hollow, jointed, leaves 2-ranked; composed of 3,500 species. *Zea, Saccharum, Agropyron.*

8. *Araceæ.*—Distinguished by perfect flowers or monœcious, spadix with spathe, no perianth, fruit succulent, leaves veiny; composed of 105 genera, 900 species. *Acorus.*

9. *Melanthaceæ.*—Distinguished by ovary superior, capsules mostly septicidal, with rootstocks, rarely bulbs, perianth 6, stamens 6, seeds appendaged, leaves grass-like, polygamous or diœcious; composed of 36 genera, 140 species. *Veratrum, Asagræa.*

10. *Liliaceæ.*—Distinguished by regular, symmetrical flowers, 6's, perianth non-glumaceous, petaloid, hypogynous ovary 3-celled, anther 2-celled; composed of 125 genera, 1,300 species. *Allium, Urginea, Aloe.*

11. *Convallariaceæ.*—Distinguished by being erect herbs, fruit—fleshy berry, no tendrils, never with bulbs or corms, flowers solitary, regular, perfect, 6's, ovary superior; composed of 23 genera, 215 species. *Convallaria, Colchicum.*

12. *Smilaceæ.*—Distinguished by being mostly vines, woody, herbaceous, often prickly stems, leaves net-veined, flowers green, diœcious, perianth 6, stamens 6, fruit globose berry, 1–6-seeded; composed of 3 genera, 200 species. *Smilax.*

13. *Iridaceæ.*—Distinguished by bulbs, corms, or rhizomes, flowers perfect, petaloid, 6's, from a spathe, stamens 3, ovary inferior, leaves equitant, fruit capsule; composed of 57 genera, 1,000 species. *Iris, Crocus.*

14. *Zingiberaceæ.*—Distinguished by creeping rhizomes, calyx and corolla distinct, each 3, leaves stalked, sheathing, ovary inferior, stamens 6; composed of 30 genera, 280 species. *Elettaria, Zingiber.*

15. *Orchidaceæ.*—Distinguished by the 1–2 sessile anthers united to pistil, flowers irregular, reptile-shape, perfect, perianth 6 in 2 rows, petaloid; composed of 410 genera, 5,000 species. *Cypripedium, Vanilla.*

SUB-CLASS **Dicotyledones.**

SERIES I. **Choripetalæ.**

16. *Piperaceæ.*—Distinguished by jointed stems, ovary sincarpic, 1-celled, stigma sessile, 2, 3, 4, fruit fleshy, 1-celled, 1-seeded; composed of 8 genera, 1,060 species. *Piper, Cubeba.*

17. *Juglandaceæ.*—Distinguished by monœcious flowers, sterile in catkins, fertile in spikes, both with calyx 3–5, leaves pinnate, exstipulate; composed of 6 genera, 36 species. *Juglans.*

18. *Salicaceæ.*—Distinguished by diœcious flowers, both kinds in catkins, no perianth or only cup-like calyx, stamens 1–30, fruit capsule; composed of 2 genera, 200 species. *Salix, Populus.*

19. *Betulaceæ.*—Distinguished by monœcious flowers, no calyx, but instead, have scaly bracts, stamens 2–4, ovary 2-celled; composed of 6 genera, 75 species. *Betula.*

20. *Fagaceæ* (*Cupuliferæ*).—Distinguished by small flowers, monœcious, staminate—aments, pistillate subtended by involucre (united bracts) becoming a bur (cup), petals none, stamens 4–20, perianth 4–8-lobed; composed of 5 genera, 375 species. *Castanea, Quercus.*

21. *Ulmaceæ.*—Distinguished by fugacious stipules, small flowers, monœcious, diœcious, perfect or polygamous, perianth 3–9-parted, or

sepals, petals none, stamens 3–9, ovary 1-celled, superior, samara, drupe or nut; composed of 13 genera, 140 species. *Ulmus.*

22. *Moraceæ.*—Distinguished by having milky juice, small flowers, monœcious, diœcious, calyx 4–5-parted, petals none, stamens 4–5, ovary 1-celled, superior, fruit various; composed of 55 genera, 925 species. *Ficus, Humulus, Cannabis.*

23. *Santalaceæ.*—Distinguished by calyx 4–5 valvate lobed, green or petaloid, stamens perigynous, sheathing disk, ovules suspended by funiculus; composed of 26 genera, 250 species. *Santalum.*

24. *Aristolochiaceæ.*—Distinguished by colored, irregular calyx, epigynous stamens, fruit capsule, many-seeded, leaves cordate; composed of 5 genera, 200 species. *Aristolochia.*

25. *Polygonaceæ.*—Distinguished by stems having many swollen joints, ochriate stipules above each, flowers perfect, calyx colored or greenish, ovary superior, 1-celled; composed of 30 genera, 800 species. *Rheum, Rumex.*

26. *Chenopodiaceæ.*—Distinguished by succulency and flowers being ebracteated, minute, greenish, perfect or unisexual, ovary superior, 1-celled, fruit 1-seeded utricle; composed of 75 genera, 550 species. *Chenopodium.*

27. *Phytolaccaceæ.*—Distinguished from Chenopodiaceæ by ovary superior of many carpels in a ring, each with individual style, stamens hypogynous; composed of 22 genera, 85 species. *Phytolacca.*

28. *Magnoliaceæ.*—Distinguished by flowers large, sweet-scented, white, red, distinct, except many pistils cohere, sepals and petals in two or more rows, leaves leathery, stipulate; composed of 10 genera, 70 species. *Illicium.*

29. *Myristicaceæ.*—Distinguished by leaves alternate, dotted, leathery, flowers diœcious, regular, calyx 3–4-cleft, filaments 3–12, united, ovary 1-celled, ovule 1, fruit succulent; composed of 5 genera, 100 species. *Myristica.*

30. *Ranunculaceæ.*—Distinguished by flowers being most complete, organs all distinct, no adhesion nor cohesion, often yellow; composed of 35 genera, 1,050 species. *Hydrastis, Cimicifuga, Delphinium, Aconitum, Pulsatilla (Anemone).*

31. *Berberidaceæ.*—Distinguished by the few stamens being in 2–3 whorls, and anthers opening by 2 hinged valves (Podophyllum—longitudinal); composed of 20 genera, 105 species. *Caulophyllum, Podophyllum.*

32. *Menispermaceæ.*—Distinguished by flowers being diœcious, petals shorter than sepals, solitary seed moon- or kidney-shaped, woody climbers; composed of 55 genera, 150 species. *Menispermum, Chondrodendron, Jateorrhiza, Anamirta.*

33. *Lauraceæ.*—Distinguished by polygamous flowers, calyx inferior, petaloid, anthers opened by 2–4 uplifted valves, ovary 1-celled, fruit drupe or berry; composed of 40 genera, 900 species. *Sassafras, Cinnamomum.*

34. *Papaveraceæ.*—Distinguished by the 2–3 fugacious sepals and

minute embryo near the base of fleshy albumin; composed of 26 genera, 200 species. *Papaver*, *Sanguinaria*, *Chelidonium*.

35. *Cruciferæ.*—Distinguished by pungent or acrid juice, cruciform flowers, tetradynamous stamens, and fruit a silique or silicle; composed of 185 genera, 1,500 species. *Sinapis*, *Brassica*.

36. *Hamamelidaceæ.*—Distinguished by ovary being inferior, ovule solitary, pendent from cell apex, fruit capsule, 2-celled; composed of 15 genera, 35 species. *Hamamelis*, *Liquidambar*.

37. *Rosaceæ.*—Distinguished by prickles, warts on woody surface, flowers regular, stamens inserted on calyx tube, perigynous; composed of 65 genera, 1,200 species. *Rubus*, *Rosa*, *Quillaja*, *Hagenia*.

38. *Drupaceæ.*—Distinguished by bark exuding gum, bark and seeds containing hydrocyanic acid, calyx 5-lobed, free from ovary, petals (5), stamens (many) inserted on calyx, ovary 1-celled, 2-ovuled, drupe; composed of 6 genera, 110 species. *Prunus*, *Amygdalus*.

Leguminosæ.

39. *Mimosaceæ.*—Distinguished by ovary several ovuled, fruit legumes, leaves 2–3-pinnate, flowers small, regular, calyx 3–6-lobed, corolla 3–6, stamens distinct or monadelphous, ovary 1-celled; composed of 30 genera, 1,350 species. *Acacia*.

40. *Cæsalpinaceæ.*—Distinguished by legumes, upper petal enclosed by lateral ones in the bud, leaves compound, stipulate, flowers perfect, monœcious, diœcious, polygamous, 5's; composed of 90 genera, 1,000 species. *Cassia* (*Cathartocarpus*), *Tamarindus*, *Hæmatoxylon*, *Copaiva*.

41. *Krameriaceæ.*—Distinguished by fruit spiny, indehiscent, leaves simple, exstipulate, sepals 4–5, petals 5, smaller than sepals, stamens monadelphous, ovary 1–2-celled, ovules 2, fruit 1-seeded; composed of 1 genus, 15 species. *Krameria*.

42. *Papilionaceæ.*—Distinguished by legumes or loments, upper petal enclosing lateral ones in the bud, leaves compound, stipulate, calyx 4–5-toothed, petals somewhat united (banner, wings, keel), stamens usually 10, pistil 1, superior; composed of 310 genera, 5,000 species. *Toluifera*, *Astragalus*, *Pterocarpus*, *Glycyrrhiza*, *Cytissus*, *Vouacapoua* (*Andira*), *Physostigma*.

43. *Geraniaceæ.*—Distinguished from Rutaceæ by leaves being nonglandular, punctate, axis of lobed fruit persistent, carpels distinct, indehiscent; composed of 10 genera, 450 species. *Geranium*.

44. *Linaceæ.*—Distinguished by flowers being regular, showy, stamens monadelphous at base, sepals imbricate, ovary 3–5-celled; composed of 4 genera, 150 species. *Linum*.

45. *Erythroxylaceæ.*—Distinguished from Linaceæ by the shrubby or arboreous habit, and by the drupaceous fruit, calyx 5-lobed, petals 5, stamens 10, hypogynous, ovary superior; composed of 3 genera, 60 species. *Erythroxylon*.

46. *Zygophyllaceæ.*—Distinguished by flowers bearing a fleshy disk, white, red, yellow, sepals 5, free, glandless; composed of 20 genera, 150 species. *Guaiacum* (*Guajacum*).

47. *Rutaceæ.*—Distinguished by leaves being exstipulate, dotted,

petals imbricated, ovary sessile, surrounded at base by fleshy, glandular disk, or elevated on gynophore; composed of 110 genera, 880 species. *Xanthoxylum*, *Pilocarpus*, *Barosma*, *Citrus*.

48. *Simarubaceæ.*—Distinguished from Rutaceæ by leaves being exstipulate, without glands or dots, disk conspicuous, ovary stalked; composed of 30 genera, 112 species. *Picrasma*.

49. *Burseraceæ.*—Distinguished by secreting a resinous or gum-resinous juice, leaves compound, dotted, disk and stamens perigynous, ovary superior; composed of 26 genera, 150 species. *Commiphora*.

50. *Polygalaceæ.*—Distinguished by flowers being irregular, papilionaceous, stamens monadelphous, sepals 5, of which two inner are winglike, petaloid; composed of 10 genera, 150 species. *Polygala*.

51. *Euphorbiaceæ.*—Distinguished by milky acrid juice, flowers unisexual, apetalous, fruit tricoccous, 3–6-seeded capsule, radical superior; composed of 210 genera, 4,000 species. *Hevea*, *Croton*, *Ricinus*, *Stillingia*, *Mallotus*.

52. *Anacardiaceæ.*—Distinguished by milky, acrid, resinous juice, petals and stamens perigynous, disk hypogynous or wanting; composed of 50 genera, 400 species. *Rhus*, *Pistacia*.

53. *Celastraceæ.*—Distinguished from Rhamnaceæ by having stamens opposite the sepals, seed arillate, disk large, flat, surrounding ovary; composed of 40 genera, 350 species. *Euonymus*.

54. *Sapindaceæ.*—Distinguished by flowers being unsymmetrical, hypogynous, leaves compound, sepals and petals on a fleshy, glandular disk; composed of 120 genera, 1,000 species. *Paullinia*.

55. *Rhamnaceæ.*—Distinguished by its spiny habit, perigynous stamens, concave petals, non-caducous, valvate sepals, fruit not a berry; composed of 45 genera, 575 species. *Rhamnus*.

56. *Vitaceæ.*—Distinguished as vines climbing by tendrils, petals 4–5, caducous, fruit 1–6-celled berry, nodose joints, flowers greenish, calyx entire or 4–5-toothed, petals 4–5, stamens 4–5, ovary 2–6-celled; composed of 10 genera, 450 species. *Vitis*.

57. *Malvaceæ.*—Distinguished by stamens monadelphous, anthers 1-celled, leaves often downy, palmate divided; flowers showy, purple, yellow, white; composed of 40 genera, 800 species. *Althæa*, *Gossypium*.

58. *Sterculiaceæ.*—Distinguished by flowers being regular or irregular, petals sometimes absent, filaments usually monadelphous, anthers 2-celled; composed of 49 genera, 730 species. *Theobroma*.

59. *Theaceæ* (*Ternstrœmiaceæ*).—Distinguished by sepals distinct, endosperm little or none, leaves alternate, flowers large, solitary, sepals 5, petals 5, hypogynous, ovary 2–several-celled, fruit 2–3-celled, woody capsule; composed of 16 genera, 160 species. *Thea*.

60. *Guttiferæ.*—Distinguished by yielding a resinous juice, stamens distinct, monadelphous or polyadelphous, flowers unisexual or polygamous, leaves coriaceous; composed of 24 genera, 340 species. *Garcinia*.

61. *Thymeleaceæ.*—Distinguished by calyx being petaloid, 4–5 imbricated lobes, stamens perigynous, radical superior, ovary 1-celled, fruit drupe; composed of 37 genera, 425 species. *Daphne*.

62. *Lythraceæ* (*Punicaceæ*).—Distinguished by calyx lobes being valvate, petals wrinkled, leaves exstipulate, stamens perigynous, inserted below the petals ; composed of 21 genera, 350 species. *Punica.*

63. *Myrtaceæ.*—Distinguished by numerous stamens, leaves exstipulate, opposite, dotted, with marginal vein, ovary inferior ; composed of 76 genera, 2,700 species. *Cajuputi* (*Melaleuca*), *Eugenia*, *Pimenta* (*Myrcia*), *Eucalyptus.*

64. *Umbelliferæ.*—Distinguished by the 2-celled ovary forming a cremocarp, with oil tubes, flowers in umbels, stems hollow, ovary inferior, crowned with fleshy disk ; composed of 170 genera, 1,600 species. *Fœniculum*, *Pimpinella*, *Carum*, *Coriandrum*, *Conium*, *Ferula*, *Dorema.*

SERIES II. **Gamopetalæ.**

65. *Pyrolaceæ.*—Distinguished by ovary superior, 4–5-celled, low mostly evergreen perennials, flowers white or pink, calyx 4–5-lobed, corolla 4–5, stamens 8–10, stigma 5-lobed, fruit dehiscent capsule composed of 3 genera, 20 species. *Chimaphila.*

66. *Ericaceæ.*—Distinguished by hypogynous corolla and stamens, anthers 2-celled, dehiscing by pores or slits, ovary 2–5-celled, leaves exstipulate, fruit capsule or berry ; composed of 55 genera, 1,050 species. *Gaultheria*, *Arctostaphylos.*

67. *Styraceæ.*—Distinguished by flowers of 5–10 stamens attached to 5-lobed corolla, anthers 2-celled, calyx coherent with ovary, superior or part inferior, fruit drupe ; composed of 7 genera, 75 species. *Styrax.*

68. *Oleaceæ.*—Distinguished by 2 stamens, ovary superior, 2-celled, each with 2 ovules, corolla regular, 4–8-cleft, fruit capsule, berry, or drupe, seed albuminous, oily ; composed of 21 genera, 500 species. *Olea*, *Fraxinus.*

69. *Loganiaceæ.*—Distinguished by opposite, entire, stipulate leaves, stamens epipetalous, styles divided as ovary cells number, fruit capsule, drupe, seeds winged ; composed of 30 genera, 400 species. *Gelsemium*, *Spigelia*, *Strychnos.*

70. *Gentianaceæ.*—Distinguished by being smooth herbs, leaves entire, glabrous, sessile, calyx and corolla persistent, ovary superior, fruit 2-celled capsule ; composed of 65 genera, 600 species. *Gentiana*, *Swertia.*

71. *Apocynaceæ.*—Distinguished by milky juice, from Asclepiadaceæ by stamens being free from style and stigma, anthers contain granular pollen, stigma hour-glass-shaped ; composed of 130 genera, 1,050 species. *Apocynum*, *Strophanthus*, *Aspidosperma.*

72. *Asclepiadaceæ.*—Distinguished by stigmas being expanded into a fleshy, 5-crowned head, pollen masses adhering to these angles, filaments monadelphous ; composed of 220 genera, 1,900 species. *Asclepias.*

73. *Convolvulaceæ.*—Distinguished by milky juice, from Solanaceæ and Scrophulariaceæ by twining, trailing habit, alternate leaves, large, solitary seeds, crumpled embryo, corolla 5's, plaited ; composed of 40 genera, 900 species. *Exogonium* (*Ipomœa*), *Convolvulus.*

BOSTON MEDICAL JUN 1 1931

74. *Hydrophyllaceæ.*—Distinguished by watery, insipid juice, flowers scorpioid, 5's, stamens borne on corolla base, styles 2, fruit capsule; composed of 17 genera, 160 species. *Eriodictyon.*

75. *Labiatæ.*—Distinguished by square stems, corolla bilabiate, stamens 4, didynamous, ovary 4-lobed, leaves aromatic, stigma bifid, fruit achenes; composed of 160 genera, 3,000 species. *Scutellaria, Marrubium, Salvia, Hedeoma, Melissa, Thymus, Mentha, Lavandula, Rosmarinus.*

76. *Solanaceæ.*—Distinguished by colorless juice, flowers with plicate border, isomerous, ovules many, fruit capsule or berry, ovary superior; composed of 70 genera, 1,600 species. *Solanum, Capsicum, Atropa, Hyoscyamus, Datura, Nicotiana.*

77. *Scrophulariaceæ.*—Distinguished by 2-celled ovary, numerous seeds, fleshy albumin, calyx 5-lobed, corolla irregular, 2-lipped, stamens 4, didynamous, ovary sessile, 2-celled, fruit capsule or berry; composed of 165 genera, 2,500 species. *Leptandra* (*Veronica*), *Digitalis.*

78. *Pedaliaceæ.*—Distinguished by superior ovary of 2 carpels becoming 1-, 2-, 4-, 8-celled, corolla bilabiate, stamens didynamous, fruit bony, capsular, seed oily; composed of 12 genera, 46 species. *Sesamum.*

79. *Rubiaceæ.*—Distinguished by regular, epigynous corolla, valvate lobes, salver, rotate, or funnel-shape, stamens on corolla tube, epipetalous, ovary crowned with an epigynous disk, fruit capsule or fleshy nuts; composed of 355 genera, 5,500 species. *Coffea, Uragoga* (*Cephaëlis*), *Cinchona.*

80. *Caprifoliaceæ.*—Distinguished by gamopetalous corolla, leaves opposite, exstipulate, stamens on corolla tube, ovary inferior, fruit berry or drupe; composed of 10 genera, 260 species. *Sambucus, Viburnum.*

81. *Valerianaceæ.*—Distinguished by corolla being epigynous, anthers free, seed exalbuminous, leaves exstipulate, ovary inferior, 3-celled, two empty; composed of 9 genera, 275 species. *Valeriana.*

82. *Cucurbitaceæ.*—Distinguished by stems being succulent, prostrate, or climbing, with tendrils, flowers unisexual, leaves and stem scabrous, fruit pulpy; composed of 90 genera, 650 species. *Cucurbita, Citrullus, Ecballium, Bryonia.*

83. *Campanulaceæ.*—Distinguished by endosperm present, fleshy, usually milky juice, flowers perfect, calyx 5-lobed, gamopetalous, stamens 5, ovary 2–5-celled, fruit capsule or berry, seeds many; composed of 60 genera, 1,500 species. *Lobelia.*

84. *Cichoriaceæ.*—Distinguished by flowers all expanded into rays (ligulate), juice milky, calyx-tube adnate to ovary, gamopetalous, 5-toothed, anthers connate, ovary 5-celled, ovule 1, fruit achene; composed of 65 genera, 1,400 species. *Taraxacum, Lactuca.*

85. *Compositæ.*—Distinguished by compound flowers, watery or resinous (rarely milky) sap, calyx-tube adnate to ovary, corolla 5-lobed, stamens 5, borne on corolla, anthers syngenesious, ovary 5-celled, ovule 1, fruit achene; composed of 760 genera, 10,000 species. *Eupatorium, Grindelia, Leptilon* (*Erigeron*), *Inula, Calendula, Anthemis, Matricaria, Anacyclus, Tanacetum, Artemisia, Arnica, Arctium.*

PART I.

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM.

SUB-KINGDOM I. **THALLOPHYT(ES)-A.**

Cellular cryptogams, composed of one or many cells, with no differentiation of root, stem and leaves, the thallus being without true woody-fibres and vessels.

CLASS: ALGÆ.

1. GIGARTINACEÆ. Red Seaweed Family.

Gi-gar-ti-na′se-e. L. *Gigartin(a)* + aceæ, fr. Gr. *γίγαρτον*, a grapestone, *i. e.*, from the resemblance of the capsules (cystocarps) which are oval, appearing as little elevated or stalked tubercles on the flat portions of the frond (thallus). Composed of many fleshy, gelatinous algæ, red, purple, or violet, with thalli flat and somewhat forked, but without distinction of nodes and branches; form and structure varying, while reproductive processes are complex; auxiliary cells and carpogonia separate, but usually in groups; universal; nutritious, demulcent, alterative.

Genera: 1. **Chondrus.** 2. **Gigartina.**

CHONDRUS. CHONDRUS (IRISH MOSS, CARRAGHEEN).

Chondrus crispus, (*Linné*) *Lyngbye*,
and } The entire plants.
Gigartina mamillosa, *Greville.*

Habitat. Atlantic Ocean, New England, Irish Coast.

Syn. Carragreen (Moss), Pearl Moss, Salt Rock Moss, Fucus Crispus. Fr. Carrageheen, Mousse (Marine) perlée; Ger. Irländisches Moss, Perl Moos, Knorpeltang.

Chon′drus. L. fr. Gr. *χόνδρος*, cartilage, gristle; *i. e.*, fronds are cartilaginous.

Cris′pus. L. curled, crumpled; *i. e.*, its physical appearance.

Gi-gar-ti′na. L. see etymology, above, of Gigartinaceæ.

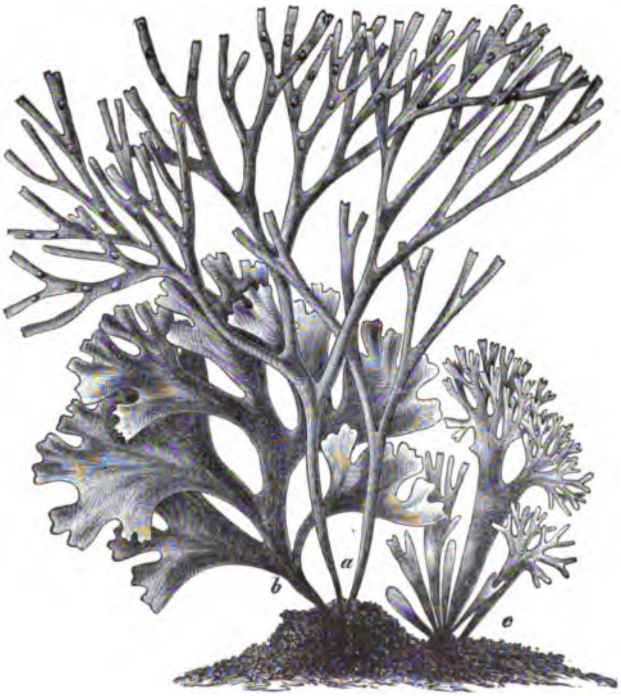
Ma-mil-lo′sa. L. *mamillosus*, breasted, filled with papillæ or breasts; *i. e.*, from the resemblance of the spores on the surface and margins of the fronds.

PLANTS.—These grow upon rocks under water, being called simply seaweeds, bladder wrack, etc. They are attached by a small disk, have a purplish color, and should be collected in the spring. The fronds are 15–30 Cm. (6–12′) long, yellowish-white (by bleaching), horny, translucent, forked, when softened in water cartilaginous, segments wedge-shaped or linear, apex emarginate or two-lobed. *Chon-*

drus crispus has spore vessels or capsules imbedded in the frond. *Gigartina mamillosa* (*Chondrus mamillosus*) has oval ones raised upon a short stalk, and its frond or thallus is slightly channelled toward the base; odor seaweed-like; taste mucilaginous, saline. When 1 part is boiled with water 30 for ten minutes we get a solution which gelatinizes on cooling, and is not colored blue by iodine T. S. *Solvent:* water. Dose, ℨj–2 (4–8 Gm.).

ADULTERATIONS.—With allied species, especially *G. acicula'ris* and *G. pistilla'ta*, which resemble the official very closely.

FIG. 1.



Chondrus crispus; *a*, narrow form, with fruit; *b*, broad form; *c*, small form.

Commercial.—It is mostly collected on the coasts of Ireland and Massachusetts by tearing it from rocks under water with hooks, tongs, etc., or it is simply taken from the beach, where storms and tides leave it, then washed, spread high upon shore, thereby becoming dried and bleached.

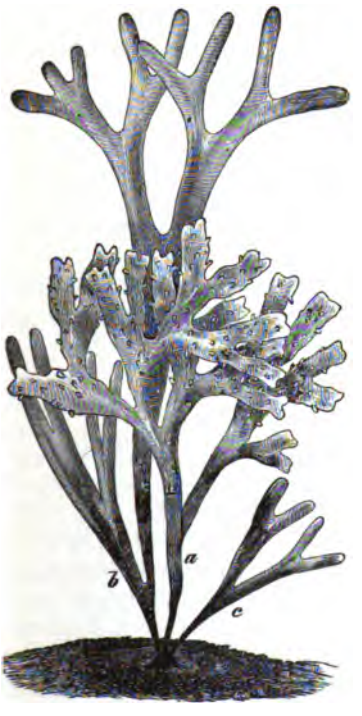
CONSTITUENTS.—Mucilage 55–80 p. c., Minerals 14 p. c., albuminoids 9 p. c., water 18 p. c., cellulose 2 p. c., ash 8–15 p. c.

Mucilage.—A kind of pectin called carrageenin, 9 p. c. of which is soluble in cold, nearly all in hot water; it differs from gum by alcohol not precipitating the aqueous solution, from starch by not turning blue with iodine, from pectin by not precipitating with lead acetate, and yielding no mucic acid with nitric acid; has only slight adhesive properties but is sometimes substituted in its three forms, *white*, *yellowish*, *yellow*, for acacia, under the name of "imitation gum arabic."

Minerals.—These are the chlorides, sulphates, phosphates (traces of iodides and bromides), of sodium, potassium, calcium and magnesium.

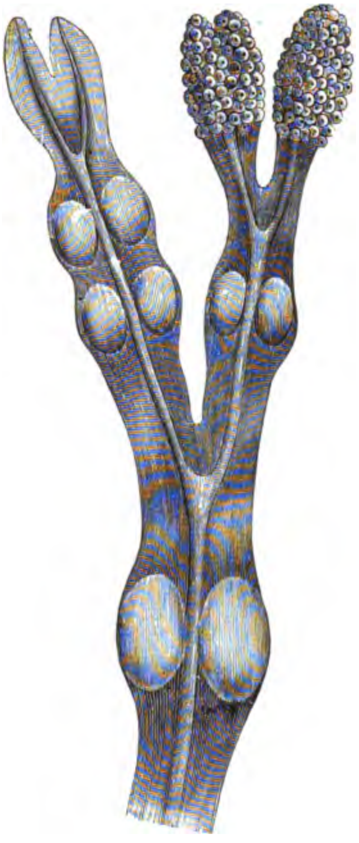
PREPARATIONS. (Unoff.)—*Decoction*, 5 p. c. (water or milk). Dose,

FIG. 2.



Gigartina mamillosa; *a*, narrow form, with fruit; *b*, large form; *c*, small form.

FIG. 3.



Fucus vesiculosus; fruiting branch, natural size.

℥ij–4 (60–120 Cc.). *Mucilage*, 3 p. c., mostly as an emulsifier. *Gelatin.* Any of these can be sweetened and flavored with lemon juice, etc., to one's pleasure. By macerating ten minutes in cold water, throwing liquid away, then boiling with fresh water, gives a solution free from any unpleasant flavor of foreign substances.

PROPERTIES.—Demulcent, nutrient, dietetic.

USES.—Bronchitis, dysentery, diarrhœa, kidney and bladder troubles, scrofula. Sheet gelatin is substituted for poultices by wrapping in flannel and moistening; can also use it as a diet wherever tapioca, sago, or barley is desired.

Allied Plants:

1. *G. acicula'ris* and *G. pistilla'ta* are very similar in appearance.
2. *Fu'cus vesiculo'sus, Bladder-wrack.*—Atlantic Ocean. Grows on muddy rocks and often floats to the shores; it is 1 M. (40') long, 15 Mm. ($\frac{3}{5}$') broad, flattened, branched, with a midrib. Air vessels in pairs, blackish, odor seaweed-like, taste mucilaginous, saline. *Fu'cus nodo'sus* is narrow, without midrib, air vessels single, otherwise similar. Contains organic matter (mainly mucilage with little mannit, fat, etc.), 62 p. c., moisture 22 p. c., ash 16 p. c.,—chlorides, bromides, iodides, phosphates, sulphates. Alterative, in obesity. Dose, ʒij (8 Gm.) in decoction.
3. *Agar-agar* (*Eucheu'ma spino'sum, E. gela'tinæ*).—Indian Ocean. Chinese or Japanese gelatin (isinglass) is prepared from these; occurs in light, spongy cakes, 4 Cm. (1½') wide and consists of gelose or pararabin.
4. *Dulse* (*Halyme'nia* (*Fu'cus*) *palma'tus* and *H. e'dulis*).—Atlantic and Mediterranean coasts. Blood-red—when dry, dark purple, fronds flat.
5. *Ceylon Moss.*—Indian Ocean. Mostly *Sphæroco'ccus lichenoi'des*, 10 Cm. (4') long, 1.5 Mm. ($\frac{1}{16}$') thick, cylindrical, forked; reddish—when dry, whitish, brittle.
6. *Corsican Moss.*—Mediterranean. A mixture of 20–30 different Algæ species. Mainly *Sphæroco'ccus* (*Fucus*) genus; these are yellowish-brown.

Class: FUNGI.

2. HYPOCREACEÆ. Flesh-consuming Family.

Hy-po-cre-a'se-e. L. fr. Gr. *ὑπο*, under, through, by, + *χρέας*, flesh, *i. e.*, some of the species live upon meat (caterpillars and other insects). Exist mostly upon dead organic matter, sometimes upon living plants and insects; rarely with chlorophyll, mycelium inconspicuous, frequently producing a dense homogeneous tissue; ascocarps complex and either open from the first, or at a later period; conidium formation occurs in many ways both from the mycelium and stoma; temperate climates; hæmostatic, ecbolic, poisonous.

Genus: 1. Claviceps.

ERGOTA. ERGOT (ERGOT OF RYE).

Claviceps purpurea, (*Fries*) *Tulasne.* } The sclerotium, replacing the grain of rye, *Secale cereale.*

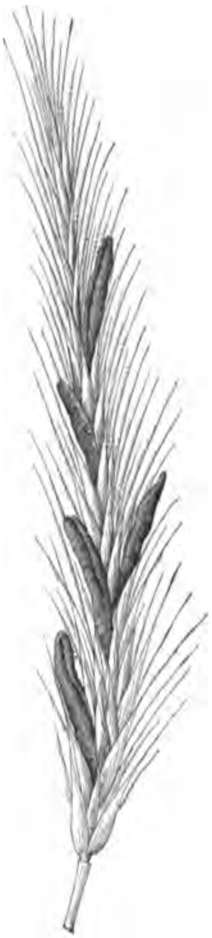
Habitat. Eastern countries, Russia. Cultivated in Spain, Germany, France.

Syn. Smut of Rye, Spurred or Cockspur Rye, Mother of Rye, Horn Seed, Secale Clavatum, Mater Secalis, Clavus Secalinus. Fr. Ergot de Seigle, Seigle Ergoté (noir), Blé Cornu. Ger. Secale Cornutum, Mutterkorn, Kornmutter, Zapfen or Hunger-korn.

HYPOCREACEÆ.

Er-go′ta. L. fr. Fr. *ergot*, *argot*, a spur; *i. e.*, its spur shape.
Clav′i-ceps. L. *clava*, a club; *i. e.*, shape of the mycelium or sclerotium.
Pur-pu′re-a. L. *purpureus*, purple colored; *i. e.*, the purple claviceps.
Scle-ro′ti-um. L. fr. Gr. *σκληρός*, hard; *i. e.*, a hard body formed by certain Fungi.
Se-ca′le. L. *secare*, to cut, or Celtic, *sega*, a sickle; *i. e.*, grain curved like a sickle, or the grain has to be cut down.
Ce′re-al-e. L. *cerealis*, cultivated grain.

FIG. 4.



Ergotized Rye.

PLANT.—Rye is to Russia what corn is to America, its bread approximating nearer that of wheat than any other grain. It has a culm 1.5–2 M. (5–6°) high; leaves .25–.5 M. (10–20′) long, rough on upper side; spike 10–15 Cm. (4–6′) long, two-sided, spikelet 2-flowered; grain or seed oblong, grooved on upper side, hairy at summit, brownish; flowers in June; fruits in July. SCLEROTIUM (ergot).—The origin of this is the biennial thallophyte (fungus) *Claviceps purpurea*, parasitic during moist seasons on the ovary of grains, grasses, Carex, and Cyperus species, etc. It has three stages of development.

1. When rye blooms a few ovaries in some of the heads are observed to be covered with a sweet, yellow mucus—*honey-dew of rye*, which, having a disagreeable odor, repels bees but attracts ants and beetles—the once supposed cause of the diseased grain. This dew contains conidia cells and sugar, a result of ovarian-tissue decomposition, caused by the growing fungus, and is soft from the numerous cells or hyphæ; the mycelium (spawn) is formed of these hyphæ, the outer layer of which yields the hymenium, a kind of membrane composed of short linear cells—the basidia, which separates the conidia; when this separation ceases and the hyphæ have penetrated the lower part of the ovary the first or sphacelia stage is completed.

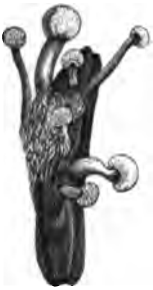
2. These hyphæ of the sphacelia unite now at the base of the ovary into a compact mass, purplish-black, and continue to grow upward in length, developing the sclerotium or official ergot.

3. This stage does not take place until the following spring, when ergot sprouts in many heads (stomata), by which the oil and other constituents are consumed, thus leaving the sclerotium shrivelled and worthless. Upon the head's surface have formed small spherical-topped excrescences, size of pin's head; these contain the orifices of flask-shaped cavities or conceptacles (perithecia) from the base of which many cells or spore-sacs (asci) arise, each containing eight filiform spores. These spores are formed about the time rye flowers, and the

two (spores and flowers) acting together develop again the sphacelia or sclerotium. Hence it is necessary to always use the fresh ergot in medicine; *i. e.*, at the end of the second stage before the third stage takes place.

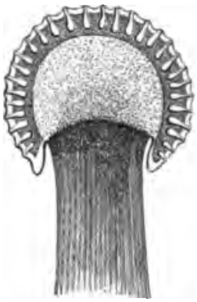
Ergot is somewhat fusiform, obtusely triangular, usually curved, 2–3 Cm. (¾–1¼′) long, 3 Mm. (⅛′) thick, three-furrowed, obtuse at both ends, purplish-black, internally whitish with purplish striæ, fracture short; odor peculiar, heavy, increased by rubbing with potassa or soda T. S.; taste oily, disagreeable. Ergot that breaks with a sharp snap, devoid of pinkish fracture, hard, brittle between the teeth, odorless and tasteless, should be rejected. Unless it be very dry and kept in well-stoppered bottles, or a few drops of chloroform be added to the closed container, a mite will ofttimes attack it, thus rendering it worthless. At best it cannot be preserved for more than a year, when the old must be discarded and fresher used. The deterioration is due to the fixed oil becoming rancid, so that if this be extracted with ether or benzin, and the ergot then dried, it will retain its medical properties much longer; the addition of benzoin (5 p. c.) to the powdered drug also acts well as a preservative. *Solvent:* diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

FIG. 5.



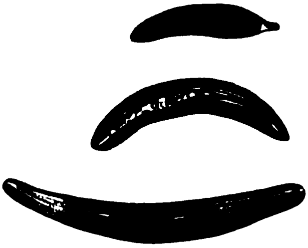
Ergot with fruit heads.

FIG. 6.



Longitudinal section of fruiting head, showing conceptacles.

FIG. 7.



Ergota.

CONSTITUENTS.—Fixed oil 30 p. c., Ergotinine (ergotine), Cornutine (ecboline), Sclerotic (sclerotinic, ergotic, ergotinic) acid, mycose, proteids, cholesterin, tannin, ash 3 p. c. (phosphates).

Ergotinine, yellowish, amorphous powder, fluorescent in alcohol, ether, but red, violet and blue with sulphuric acid, harmless. Dose, gr. $\frac{1}{30}$–$\frac{1}{10}$ (.002–.006 Gm.).

Cornutine, reddish mass or yellowish powder, insoluble in ether, and is the chief active constituent of the alcoholic extract, which also has sphacelic acid. The aqueous extract contains chiefly ergotic acid and sphacelates. Bonjean's ergotin is the aqueous extract from which scleromucin is precipitated by alcohol, then filtered and evaporated; yield 8–12 p. c. Dose (cornutine), gr. 1/20–1/6 (.003–.01 Gm.).

Dragendorff has isolated the following: 1. Sclerotic (sclerotinic, ergotic, ergotinic) acid 4.5 p. c., very active and used hypodermically. 2. Scleromucin 2–3 p. c., mucilaginous, ecbolic, precipitated by alcohol when added to aqueous extract of the drug. 3. Sclererythrin 1/100 p. c., red coloring-matter resembling madder, soluble in alcohol, ether, alkalies. 4. Scleroiodin 1/10 p. c., bluish-black powder, soluble in alkalies or sulphuric acid with violet color. 5. Fusco-sclerotinic acid. 6. Picro-sclerotine, very poisonous. 7. Sclerocrystallin, $C_7H_7O_3$. 8. Scleroxanthin, $C_7H_7O_3 + H_2O$, crystalline, soluble in ether; the last two inert.

Kobert claims for ergot only three constituents: Ergotic acid, Sphacelic acid (sphacelotoxin), Cornutine. Jakoby has isolated Chrysotoxin, Secalintoxin, Sphacelotoxin, Ergochrysin, the first possessing best and longest the ergot properties, the last being inactive.

None of the constituents represents the entire activities of the drug, the nearest approach being in ergotinine (ergotine) and sclerotic acid taken together; nearly all of them are of a changeable nature, amorphous, resembling gelatine, being difficult, therefore, to isolate and purify.

Preparations.—1. *Extractum Ergotæ Fluidum.* Fluid Extract of Ergot. (Syn., Br. Extractum Ergotæ Liquidum; Fr. Extrait liquide de Seigle ergoté; Ger. Extractum Secalis Cornuti Fluidum, Mutterkorn Fluidextrakt, Flüssiges Mutterkornextrakt.)

Manufacture: Macerate, percolate 100 Gm. with acetic acid 2 Cc., diluted alcohol 98 Cc., finishing with diluted alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Prep.: 1. *Extractum Ergotæ.* Extract of Ergot. (Syn., Br. Ergotinum, Ergotin, Extractum Hæmostaticum; Fr. Extrait d'Ergot de Seigle; Ger. Extractum Secalis Cornuti, Mutterkornextrakt.)

Manufacture: Evaporate fluid extract of ergot, 150 Cc., at 50° C. (122° F.), to a pilular consistence. Dose, gr. 2–10 (.13–.6 Gm.).

2. *Vinum Ergotæ.* Wine of Ergot. (Syn., Fr. Vin de Seigle Ergoté; Ger. Mutterkornwein.)

Manufacture: 15 p. c. Percolate 15 Gm. with alcohol 15 Cc., white wine 85, finishing alone with white wine q. s. 100 Cc. Dose, ʒj–3 (4–12 Cc.).

Unoff. Preps.: Infusion, 5 p. c. *Tincture,* 15 p. c. Ergotin. Dose, hypodermically, gr. ¼–5 (.016–.3 Gm.). Sclerotic acid. Dose, gr. 1/10–¾ (.006–.048 Gm.).

Properties.—Emmenagogue, ecbolic, parturient, astringent, hæmostatic, excitomotor, poisonous. Contracts all unstriped (involuntary) muscle, especially uterus and intestine, thereby expelling their contents; the action upon the uterus is both centrally (cornutine) and peripherally (sclerotic acid). Depresses heart muscle, hence slows pulse, contracts arterioles (hæmostatic), thus increasing arterial pressure;

diminishes sweat, saliva, milk, urine. In large doses gastro-intestinal irritant, causes nausea, vomiting, colic, thirst, purging, convulsions, "acute ergotism," or by many small doses may have "chronic ergotism"; this last may be in two forms: 1. Convulsive, causing tetanoid spasms of the flexors, respiratory muscles, death by asphyxia. 2. Gangrenous, causing cold, numb limbs, loss of sensibility, gangrene of lower extremities, buttocks, etc., epileptic convulsions, coma, death.

Uses.—In labor to increase the power and duration of uterine contractions; these are continuous while natural labor pains are intermittent, hence ergot is dangerous in thoughtless hands. Should never be used until after head is born, when it simply promotes firm, uterine contraction; it is still wiser to withhold it until after birth, to prevent post-partum hemorrhage and aid womb contraction (fluid extract ʒj (4 Cc.) by mouth or, better, hypodermically). Used also in chronic metritis, dysmenorrhœa, menorrhagia, fibroids, polypi, plethoric amenorrhœa, atonic spermatorrhœa, atonic arterial hemorrhage (males and females), spinal congestions, splenic enlargement, lax sphincters, incontinence of urine, aneurisms, diabetes. Externally to hemorrhoids.

For hypodermic injection—deprive solid extract of all alcohol, dissolve in water, and introduce near seat of trouble; results here much better than by mouth; must have bladder and bowels freely open. The ergot formed on grasses is often sufficient to cause grazing animals to abort, and flour made of grain containing much of it will also sometimes act medicinally.

Poisoning: Evacuate stomach (pump, emetics, purgatives), use tannic acid, stimulants, amyl nitrite (inhalation), friction, hot baths.

Incompatibles: Cardiac and motor depressants (aconite, veratrum, lobelia, etc.), caustic alkalies, metallic salts.

Synergists: Digitalis, belladonna (circulation), strychnine (nerves), ustilago, gossypium, hydrastine, emmenagogues.

Allied Plants:

1. *Ustila'go May'dis, Corn Smut.*—The fungus growth upon *Zea Mays* official, 1880–1890. United States, etc. The fungus is abundant upon stem, grains and tassel; in irregular, globose masses 10–15 Cm. (4–6′) broad, consisting of a blackish, gelatinous membrane enclosing many blackish, globular, nodular spores, odor and taste disagreeable. Should be kept dry and not longer than one year; contains fixed oil 2.5 p. c., sclerotic acid, crystalline principle (ustilagine) and alkaloid (secaline), volatile base, sugar, mucilage, ash 5 p. c. Used as emmenagogue, parturient, increases uterine pains during labor, like ergot. Dose, gr. 15–30 (1–2 Gm.).

2. *Saccharomy'ces* (*To'rula*) *cerevi'siæ, Fermentum* (*Yeast*).—A peculiar insoluble product of the fermentation of malt liquors produced by this fungus official, 1820–1840, 1860–1880. Yeast plant is unicellular, multiplies by budding, being produced during alcoholic fermentation of saccharine fluid, in two forms: 1. Top or surface yeast, most active, semifluid, frothy mass, odorous, cellular, fermenting in three or four days at 15–20° C. (59–68° F.). 2. Bottom or sediment yeast,

works at 6–8° C. (43–46° F.), much slower, reproduces by isolated spores. Liquid yeast becomes hard, dry (yeast cake), retaining vitality a long time, contains C 49.9 p. c., H 6.6 p. c., N 12.1 p. c., O 31.4 p. c., insoluble in alcohol, water. Used as tonic, stimulant, laxative, antiseptic poultices, for typhoid, diabetes, diarrhœa, scurvy, diphtheria, sores, bruises. Dose, ℥j–2 (30–60 Gm.).

3. *Poly'porus* (*Bole'tus*) *fomenta'rius*, *Agaric of the Oak* (*Touch Wood*).—The fungus official, 1830–1840. Europe, on *Quercus* and *Fagus* species. It is formed by an additional layer of fibres each year; is collected Aug.–Sept., and resembles the horse's hoof, being 15–25 Cm. (6–10′) wide. When young is soft, velvety, but becomes hard and ligneous; when deprived of outside ligneous portion, brownish above and yellowish-white beneath, porous, fibrous, tough, inodorous, tasteless; when for use is deprived of harder rind, sliced, boiled in lye, washed, beaten until soft and pliable, then absorbs twice its weight of water; contains extractive, resin, nitrogenous matter, KCl, $CaSO_4$; the ash has Fe, Ca, Mg, phosphate. Used locally with pressure to arrest hemorrhage. Agaric steeped in nitre solution yields spunk or tinder.

Agaricin, $C_{16}H_{30}O_5 + H_2O$, is from *Poly'porus officina'lis*; occurs in white crystals, sweet at first then bitter, soluble in alcohol. Antihydrotic; night-sweats of phthisis, sweating from coal-tar products and salicylates. Dose, gr. ½–2 (.03–.13 Gm.). Agaricin contains agaricic acid, which is the active and better principle to use.

4. *Aga'ricus musca'rius* (*Amani'ta musca'ria*), *Fly Fungus* (*Agaric*).—N. Europe, Russia. This mushroom grows in the autumn mainly, under pine trees; stalk is white, tuberous at base, 7.5–15 Cm. (3–6′) high, 1.8 Cm. (¾′) thick. Cap (pileus) 10–15 Cm. (4–6′) broad, orange-red. Contains chiefly *muscarine* (muscarina), $C_5H_{15}NO_3$, a colorless, odorless, crystalline, deliquescent alkaloid, yielding deliquescent salts (nitrate, sulphate); all usually occur as brown, syrupy liquids, soluble in water, alcohol; resembles Calabar bean in action; antihydrotic, antispasmodic, myotic. Reduces force and frequency of pulse, contracts muscles of intestines and bladder, increases abdominal secretions, causes dyspnœa, paralysis, death. Given for intestinal torpor, duodenal catarrh, diabetes, antidote to atropine, to replace eserine. Dose (muscarine), gr. $\frac{1}{30}$–$\frac{1}{15}$ (.002–.004 Gm.).

CLASS: LICHENES.

3. PARMELIACEÆ. The Foliaceous-Lichens Family.

Par-me-li-a'se-e. L. *Parmeli*(*a*) + aceæ, fr. Gr. πάρμη, a small shield, + εἴλω, to roll, or twist up, *i. e.*, the thallus. The thallus is imbricate-foliaceous, appressed or rarely ascendant, membranaceous, sparingly fibrillose beneath; the apothecia scutelliform, subpedicellate, with mostly thin disk and colorless hypothecium; universal, starchy, tonic, demulcent, astringent.

Genus : 1. **Cetraria.**

CETRARIA. CETRARIA (ICELAND MOSS).

Cetraria islandica, *Acharius.* } The dried lichen.

Habitat. N. Hemisphere, N. America (N. England to North Carolina, British America, Spain, Italy, Siberia, Himalayas, Iceland; mountains and sandy plains).

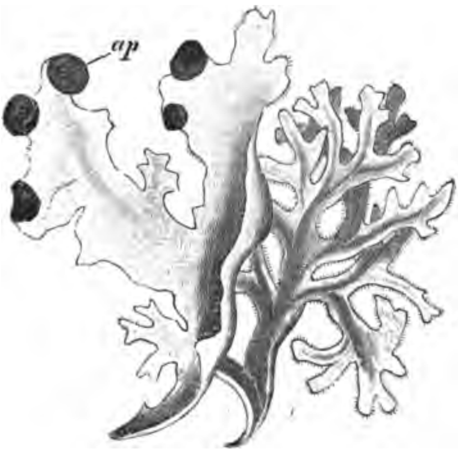
Syn. Iceland Lichen. Fr. Mousse (Lichen) d'Islande. Ger. Lichen Islandicus, Isländisches Moss, Isländische Flechte, Lungenmoos.

Ce-tra′ri-a. L. *cetra*, a shield; *i. e.*, the receptacle (apothecia) being shield or buckler-shaped.

Is-lan′di-ca. L. obsolete form of *icelandica*, Eng. form, *iclandic*, of or belonging to Iceland.

PLANT.—This has a thallus 5–10 Cm. (2–4′) high, foliaceous, with fringed and channelled lobes, brownish above, whitish beneath, marked with small, depressed spots, brittle, inodorous; the apothecia (fruits), sometimes present, are brown, round, flattish, and near the margin. When softened with water cartilaginous, slight odor, mucilaginous, bitter taste; when boiled with water (20 parts) and cooled, yields a bitter jelly; and on diluting this with an equal quantity of water and adding alcohol a flocculent precipitate is obtained, being blue with iodine. It is mainly exported from Sweden. *Solvent:* boiling water. Dose, ʒss–1 (2–4 Gm.).

FIG. 8.



Cetraria islandica; *ap*, apothecium.

ADULTERATIONS.—Pine leaves, mosses, and other lichens, which should always be removed. The official lichen often varies in color, size, shape, and width of the divisions, dependent upon the place where grown.

CONSTITUENTS.—Lichenin (iso-lichenin, dextro-lichenin) 70 p. c., Cetrarin 2 p. c., lichenstearic acid, $C_{14}H_{34}O_3$, 1 p. c. (fumaric and oxalic acids, sugar, thallochlor(ophyll), cellulose 16 p. c., ash 2 p. c.).

Lichenin (Lichen Starch), $C_{12}H_{20}O_{10}$, consists of two principles—lichenin, the greater and gummy portion, not blue with iodine, combines with bases and separates from the decoction as jelly; this when washed yields carbohydrate—isolichenin which is blue with iodine, precipitated by alcohol, and does not combine with bases.

Cetrarin (Cetraric Acid), $C_{18}H_{16}O_8$, bitter principle, white crystals; obtained by boiling with alcohol, expressing, adding to filtrate diluted hydrochloric acid and water. Upon standing cetrarin will deposit, or can simply macerate with water, or better alkaline water. Dose, gr. 1–3 (.06–.2 Gm.).

PREPARATIONS.—1. *Decoctum Cetrariæ.* Decoction of Cetraria. (Syn., Decoction of Iceland Moss; Fr. Tisane (Décocté) de Lichen d'Islande; Ger. Isländisch-Moss-Absud (Decoct.).)

Manufacture: 5 p. c. Macerate 5 Gm. one-half hour with 40 Cc. cold water (to remove some cetrarin), reject liquid, and boil the drug half hour with water 100 Cc., strain, adding water q. s. 100 Cc. May be made with milk, to which sugar and any preferred aromatic can be added. Dose, ℥j–4 (30–120 Cc.).

Unoff. Preps.: Infusion, 5 p. c. *Jelly,* 33 p. c. *Gelatina saccharata.*

PROPERTIES.—Demulcent (starch), tonic (cetrarin), nutritive to mucous membranes, lungs, bowels, stomach; increases the formation of red and white corpuscles, appetite and digestion.

USES.—Chronic catarrhs, pulmonary affections, bronchitis, chronic diarrhœa, dysentery, consumption, constipation.

The gum and starch render it so nutritive that Laplanders and Icelanders make bread from the powder after freeing it from cetrarin. It is sweet and can be used in pharmacy instead of acacia, although it possesses no adhesiveness. The Danish physicians first used it extensively. Cetrarin itself is employed in chlorosis or debility with constipation, but excessive doses cause nausea and diarrhœa.

Allied Products:

1. *Lecano'ra tarta'rea, Lacmus* (*Litmus*).—Holland. This is a blue pigment obtained from this and other lichens by powdering, mixing with potash and urine, or other ammoniacal liquid, then exposing to the air. The liquid turns gradually red, purple, and blue, when it is mixed with enough chalk to be formed into 12–25 Mm. (½–1′) rectangular cakes. By slightly different processes on the same lichens we obtain the allied pigments, orchil and cudbear. Litmus is used to determine the acidity or alkalinity of urine and other animal fluids—acids turning it red, alkalies blue; orchil is a deep-purple, pasty mass, used as a dye; cudbear is a purplish-red powder, used as a dye and to color various medical preparations.

SUB-KINGDOM II. PTERIDOPHYT(ES)-A.

Vascular cryptogams (ferns), mostly terrestrial; stems, roots, leaves, woody-fibres and vessels well developed, spores go into flat or irregular prothallia bearing antheridia and archegonia.

CLASS: FILICINÆ.

4. POLYPODIACEÆ. Fern Family.

Pol-i-po-di-a'se-e. L. *Polypodium* + aceæ, fr. Gr. πολύς, many, + πούς, ποδός, foot—many feet, rays; *i. e.*, from the branched rootstocks of some species. Includes nine-tenths of our ferns, being the typical family. Herbaceous with a permanent stem, which is usually prostrate or subterranean. Fronds large, simple, pinnate, pinnatifid or decompound, coiled in vernation; numerous sporangia, on the underside or margins, in clusters (sori). Sori with or without membranaceous covering (indusium), prothallium green; universal, bitter, astringent, anthelmintic, mucilage, tonic.

Genus: 1. **Dryopteris.**

ASPIDIUM. ASPIDIUM (MALE FERN).

Dryopteris { **Filix-mas,** (*Linné*) *Schott.*
marginalis, (*Linné*) *Gray.* } The rhizome.

Habitat. 1. N. America, N. Asia, Europe, N. Africa. (Canada, westward to Rocky Mountains, Mexico, S. America, Andes, Himalaya Mountains, Polynesian Islands.) 2. N. America, southward to N. Carolina, mountains.

Syn. Male Shield Fern, Bear's Paw Root, Sweet Brake, Knotty Brake, Shield Root. Br. Filix-mas, Radix Filicis maris. Fr. Fougère mâle. Ger. Rhizoma Filicis, Farnwurzel, Wurmfarn, Waldfarn, Johanniswurzel.

Dry-op′te-ris. L. fr. Gr. *'δρυοπτερίς = δρυός*, of the oak, growing among trees, in thickets, + *πτέρις*, a feather, wing or fern; *i. e.*, their favored place of growth.

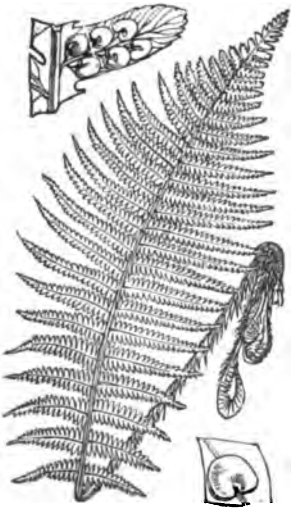
Fil′ix-mas. L. *filix*, a fern, fr. Gr. *πτέρις*, fern, frond, etc., + *mas*, male; *i. e.*, referring to its asexual fructification.

Mar-gi-nal′is. L. *margo*, *marginis*, margin; *i. e.*, the fruit dots are near the edge of the frond.

As-pid′i-um. L. fr. Gr. *ασπίδιον*, a little shield; *i. e.*, shape of the indusium.

PLANTS.—Perennials; fronds .3–1 M. (1–3°) high or long, bipinnate, pinnæ lanceolate, circular fruit dots situated on the veins, in the first species near the midrib, in the second near the margin, covered by a heart-shaped indusium. RHIZOME, horizontal, 15–30 Cm. (6–12′) long, 5–7.5 Cm. (2–3′) thick, covered with stipe remnants; these remain green several years, and often constitute a goodly portion of the official drug. When deprived of stipes, roots, etc., the rhizome itself is 7.5–15 Cm. (3–6′) long, 12–25 Mm. (½–1′) thick, brownish outside, greenish inside, 8–12 (*Filix-mas*) fibro-vascular bundles = scalariform ducts, or only 6 (*marginalis*) in an interrupted circle, having outside of these many smaller ones. The parenchyma cells contain starch and green oil, the intercellular spaces short-stalked oil-glands; odor slight, disagreeable; taste sweet, acrid, bitter, astringent, nauseous. *Solvents:* Alcohol; ether the best, as it extracts fixed oil, filicin, filicic acid, chlorophyll, volatile oil and resin, all being present in the official oleoresin. Dose, ʒss–2 (2–8 Gm.).

FIG. 9.



Dryopteris Filix-mas.

ADULTERATIONS.—With rhizomes of most indigenous ferns resembling the official, although such are thinner, free from chaff, and have stipes rarely closely imbricate.

Commercial.—Rhizome should be collected when strongest—late summer; the chaff, dead portions of rhizome and stipes must be discarded, and only green, spongy parenchymatous portions retained, which should be quickly dried and made into preparations, owing to rapid deterioration, as it usually becomes inert within one or two years. The powder must always be kept in well-stoppered bottles.

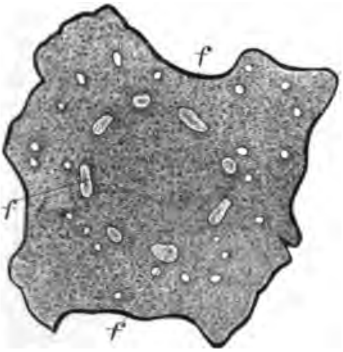
CONSTITUENTS.—Filicic acid, 5–10 p. c.; Filicin, 19–31 p. c.; fixed oil, 6–7 p. c.; filitannic acid, 10 p. c., filix red, chlorophyll, volatile oil, resin. Böhm isolates Aspidin (2–3 p. c.), Albaspidin, Aspidinin, Aspidinol and Flavaspidic acid, and claims virtue to be chiefly in aspidin and filicic acid combined.

Filicic (Filicinic) Acid, $C_{35}H_{42}O_{13}$, most active constituent, white, amorphous or crystalline, tasteless, more soluble than its anhydride, poisonous. Dose, gr. 10–20 (.6–1.3 Gm.).

Filicin (Filicic Anhydride), $C_{35}H_{40}O_{12}$, yellowish-white, non-poisonous, crystalline, soluble in most solvents except aqueous; yields with fusing potassa butyric acid and phloroglucin.

PREPARATIONS.—1. *Oleoresina Aspidii.* Oleoresin of Aspidium.

FIG. 10.



Filix-mas; transverse section magnified 3 diam.; *f*, fibro-vascular bundles.

FIG. 11.

Filix-mas; surface of peeled rhizome.

(Syn., Oil of Fern; Br. Extractum Filicis Liquidum (Æthereum), Oleum Filicis Maris; Fr. Huile (Extrait éthéré) de Fougère Mâle; Ger. Extractum Filicis, Farnextrakt, Wurmfarnextrakt, Wurmfarnöl.)

Manufacture: Percolate 100 Gm. with ether until exhausted, recover ether; yield 10–15 (acetone 18) p. c. This contains filicic acid 6–11 p. c., some of which deposits in granular crystals upon standing, consequently must be well shaken before dispensing. Dose, ʒss–1 (2–4 Cc.) every three hours. Deaths have occurred from ʒvj (24 Cc.).

Unoff. Preps.: Extract. Dose, gr. 15–30 (1–2 Gm.). *Fluid Extract.* Dose, ʒj–2 (4–8 Cc.).

PROPERTIES.—Tæniafuge, tonic, astringent.

USES.—This was known to the ancients as a vermifuge, being mentioned by Dioscorides, Galen, Pliny, Theophrastus, etc. In 1775 the King of France bought and made public this then secret tapeworm remedy from the Swiss surgeon Nouffer's widow.

When requiring this medicine the patient must fast the previous day, being nourished only by a little bread and milk; at night take ʒj (30 Cc.) castor oil, to expel nidus, and on the following morning a full dose of oleoresin, still fasting; in three hours may repeat the dose. At noon can begin moderate eating, and at night give another cathartic—castor oil ʒj (30 Cc.), or a full dose of calomel, jalap, gamboge or Epsom salt, to clear away the dead worm.

Allied Plants:

1. *D. ri′gida* (*Aspidium ri′gidum*).—S. Europe, California. Rhizome longer, thinner, with six vascular bundles. *D. athama′ntica* (*A. athama′nticum*). S. Africa. Rhizome thicker, firmer than official, inside brownish, with black resin dots, broader vascular bundles.

2. *Osmu′nda rega′lis, Flowering Fern, Adia′ntum peda′tum, Maiden-Hair* and *Polypo′dium vulga′re, Common Polypody.*—All used for chronic catarrh, asthma, pectoral demulcent, tonic.

CLASS: LYCOPODINÆ.

5. LYCOPODIACEÆ. Club-Moss Family.

Li-ko-po-di-a′se-e. L. *Lycopodi-um* + aceæ, fr. Gr. λύκος, a wolf, + πούς, ποδός, a foot; *i. e.*, from appearance of the shoots to a wolf's foot. Herbs resembling mosses. Distinguished by creeping stems, corms; leaves small, sessile, 4–16 ranks; sporangia in axis of leaves or scales, 1–3-celled, often reniform, 2-valved, containing many yellow spores, of one kind only, marked at summit with 3 radiating lines; prothallia subterranean, with or without chlorophyll; monœcious; universal; emetic, purgative, aphrodisiac, acrid principle poisonous, some spores inflammable.

Genus: 1. Lycopodium.

LYCOPODIUM. LYCOPODIUM.

Lycopodium clavatum, *Linné,* and other species. } The spores.

Habitat. Europe, Asia, N. America, in dry woods.

Syn. Club Moss, Vegetable Sulphur, Brimstone or Powder, Wolf Claw, Fox Tail, Staghorn, Lycopodium Moss, Semen or Pulvis Lycopodii. Fr. Lycopode, Soufre Végétal, Pied de Loup. Ger. Bärlappsamen, Hexenmehl, Streupulver, Blitzpulvre.

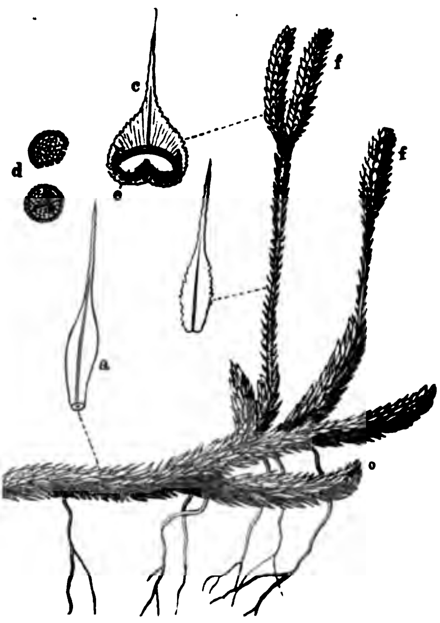
Ly-co-po′di-um. L. see etymology, above, of Lycopodiaceæ.

Cla-va′tum. L. *clavatus*, club like; *i. e.*, alluding to club-like appearance of the fertile spikes.

PLANT.—Low creeping perennial; stem .6–3 M. (2–10°) long, slender, tough, flexible, woody; branches ascending, leafy, the fertile terminated by a slender peduncle 10–15 Cm. (4–6′) long, with 1–2 linear, cylindrical spikes—thecæ, cones, capsules, 2.5–5 Cm. (1–2′) long; leaves linear, awl-shaped, 6 Mm. (¼′) long, dense, light-green, tipped, as are also the numerous bracts, on the flowering spikes with a fine bristle; in axils of bracts have the kidney-shaped sporangia containing the spores. SPORES, a pale-yellowish fine powder, mobile, inodorous, tasteless, floating upon water, not wetted by it, burning quickly with hissing, giving a yellowish-white light; under microscope spores sphæro-tetrahedral, surfaces reticulated, ridged, edges beset with short projections. While *L. clava'tum* furnishes most, yet considerable comes from *L. complana'tum*, *L. anno'tinum*, and *L. inunda'tum*.

ADULTERATIONS.—1. Pollen of many Pinaceæ (*Pinus sylvestris*, *P. palustris*, etc.), which under microscope consist of an elliptical cell with a globular cell at each end, is less fine and mobile, and mixes more easily with water than lycopodium. 2. Talc, gypsum (increase ash beyond 4–5 p. c., and quickly subside when shaken with carbon disulphide, chloroform, or water). 3. Starch, flour (blue with iodine and sink in carbon disulphide), dextrin (soluble in water, when concentrated precipitated by alcohol), sulphur (dissolves in carbon disulphide, remaining upon evaporation), resin (treat with alcohol, evaporate the tincture), turmeric (reddish-brown with alkalies).

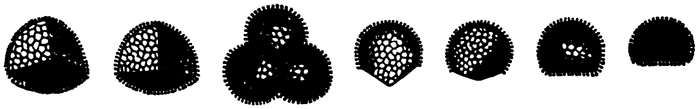
FIG. 12.



Lycopodium clavatum; *o*, a fragment of stem with spore-bearing spikes *f*, *f*; *a*, leaf of stem; *b*, leaf of fertile branch; *c*, cone scale (bract) showing sporangium *e*; *d*, spores.

Commercial.—Lycopodium (club moss) is obtained by cutting off tops when fruit spikes (cones) are nearly ripe; the spores are afterward shaken out of the sporangia, then sifted. Chiefly collected in Russia, Germany and Switzerland in July–Aug.

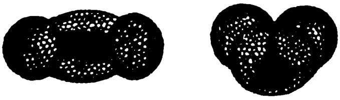
FIG. 13.



Lycopodium.

CONSTITUENTS.—Fixed oil 47–49 p. c. Cane sugar 2 p. c.; volatile base (methylamine), ash 4–5 p. c. (= sand + 1 p. c. P_2O_5). The substance of the cell wall is called pollenin; when treated with potassa gives yellow color,

FIG. 14.



Pollen of pine.

becoming blue upon the addition of sulphuric acid and iodine. The oil contains a peculiar oleic acid.

Properties.—Once considered diuretic, antispasmodic for rheumatism, epilepsy, pulmonary and renal disorders, dysentery.

Uses.—Externally to protect tender and raw surfaces, erysipelas, eczema, herpes, ulcers, chafing in infants; in pharmacy as a basis for insufflations, also to prevent adhering of pills, suppositories, etc. Popular "homœopathic medicine" (1 to 100 milk sugar triturated till oil liberated); internally gives excited circulation, urinary irritation, often cures dyspepsia, flatulence, constipation, aneurism, mucous membrane troubles of lungs and bronchi, diphtheria.

Sub-kingdom III. **SPERMATOPHYT(ES)-A (PHANEROGAMIA).**

Seed-producing plants, each containing a complete embryo, and includes the greatest number (120,000), as well as the highest forms of plants.

Class: GYMNOSPERMÆ (**Seeds naked, not enclosed in an ovary**).

6. PINACEÆ (CONIFERÆ). Pine Family, Conifers.

Pi-na'se-e. L. *Pin(us)* + aceæ, fr. Celtic *pin, pyn,* a mountain, rock; *i. e.*, habitat of some species. Trees or evergreen shrubs. Distinguished by abounding in oleoresinous juice; leaves needle-shaped, entire, parallel-veined; flowers monœcious—staminate in catkins, without calyx or corolla—pistillate in cones; ovules naked, two or more on upper surface of each scape (carpel); fruit woody cone; seeds naked, cotyledons two or many, wood without ducts, with discoid markings; temperate climates; stimulant, diuretic, emmenagogue, anthelmintic, expectorant, timber.

Genera: 1. **Pinus.** 2. **Abies.** 3. **Juniperus.**

TEREBINTHINA. TURPENTINE.

Pinus palustris, *Miller,* and other species. } A concrete oleoresin.

Habitat. S. United States, Virginia to Texas, near the coast.

Syn. Long leaved-, Yellow Pitch-, Broom-, Pitch-, Swamp or Georgia Pine, Common Frankincense, Terebinthina Communis, Crude Turpentine, Thus Americanum. Fr. Térébenthine Commune, T. de Bordeaux. Ger. Gemeiner Terpentin.

Pi'nus. L. see etymology, above, of Pinaceæ.

Pa-lus'tris. L. *paluster*, swampy; *i. e.*, it inhabits swamps or near marshy places.

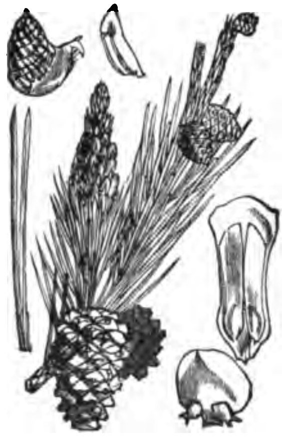
Ter-e-bin'thi-na. L. *terebinthus*, Gr. τερεβινθος, of or from the *terebinth* = *turpentine tree.*

Tur'pen-tine, fr. *turbentine, terebinthine, terebinthina.*

Plant.—*Pinus palustris* (*P. austra'lis, i. e.*, southern); large tree, 18–30 M. (60–100°) high, .3–.6 M. (1–2°) thick, grows in dry sandy soil, from the sea to 100 miles (160 Km.) inland; bark thin, scaled, furrowed; wood hard, resinous; leaves many, crowded at end of branches, in threes, .25–.4 M. (10–15′) long, very narrow, sharp-pointed, triquetrous, in clusters surrounded by a sheath 25 Mm. (1′) long; flowers sterile in violet aments, 5 Cm. (2′) long; fruit cone, large, oblong, 15–25 Cm. (6–10′) long, scales armed with short spine. Young trees resemble brooms; this furnishes nearly all the turpentine and rosin of commerce. OLEORESIN (turpentine), in yellowish, opaque, tough masses, brittle when cold, crumbly-crystalline inside; terebinthinate odor and taste; alcoholic solution has acid reaction, rarely seen as yellow, opaque, viscid liquid. Dose, gr. 15–60 (1–4 Gm.).

Commercial.—Common white turpentine comes mostly from North Carolina, some from South Carolina and Georgia. It is secreted in the sapwood, exudes spontaneously somewhat, but to get it in large quantities the trees must be *boxed*, which consists in cutting, during winter, with a special axe, in the tree trunk 1–4 cavities, each holding 4–8 pints (2–4 L.); these are begun 20–30 Cm. (8–12′) above ground, are triangular in shape, 30 Cm. (12′) in width, 15 Cm. (6′) in depth and height, being excavated downward. About 1 M. (3°) above each box the bark is removed and wood hacked in shape of letter L (*cornering*). The "crude" begins flowing the middle of March, but runs best July–Aug., slackening Sept.–Oct. Boxes are frequently emptied with "turpentine ladles or dippers" from which it is poured into barrels (250 lbs.; 110 Kg.) to be used for distilling the oil. Every few weeks the trees are hacked a little higher using ladders; the first year's flow, *virgin dip*, is best; yields 6½ gallons (24 L.) of oil per barrel and window glass rosin. Succeeding years yield *yellow dip*, giving 4 gallons (15 L.) of oil per barrel and ordinary grades of rosin. Some hardens on trees, *scrapings*, *scrape*, which gives 2 gallons (7.5 L.) of oil per barrel, and brownish-black rosin.

FIG. 15.



Pinus palustris.

CONSTITUENTS.—Volatile oil 20–30 p. c., Rosin (resina, resin) 50–60 p. c., bitter principle, formic, succinic, and possibly other resin acids—pinic and sylvic acids.

Oleum Terebinthinæ. Oil of Turpentine, $C_{10}H_{16}$, *official.*—(Syn., Fr. Essence de Térébenthine (Huile volatile de T.); Ger. Terpentinöl.)

This volatile oil is obtained by distilling the oleoresin, adding occasionally some water. When oil ceases to come over, resin is run off from bottom of still and strained into barrels. On condensing distillate the oil floats on top of the water, when it is dipped out and barrelled for market. It is a thin, colorless, neutral liquid, sp. gr. 0.855–0.870, boils at 155–170° C. (311–338° F.), soluble in 3 volumes alcohol, 1 glacial acetic acid; composed chiefly of dextrogyrate pinene (French oil levogyre), takes fire with mixture of nitric and sulphuric acids, yields slight residue (abs. petroleum, paraffin oils, resin). Bromine or iodine acts on it violently; by age becomes stronger and less pleasant, owing to formation of ozone, resin, formic and acetic acids; with hydrochloric acid forms artificial crystalline camphor, $C_{10}H_{16}HCl$.

Resina. Resin (Colophony), *official.*—(Syn., Rosin, Colophonium, Colophane; Fr. Résine blanche (jaune); Ger. Kolophonium, Geigenharz.) The residue left after distilling off the volatile oil from turpentine. It is a transparent, amber-colored solid, hard, brittle, pulverizable; fracture glossy, shallow-conchoidal; odor and taste faintly terebinthinate, sp. gr. 1.075, soluble in alcohol, ether, fixed or volatile oils, potassa or soda solutions; its varieties depend upon color, and that upon degree of heat used in distillation—the older the trees the greater the yield of rosin, the less that of oil. Contains anhydride of abietic acid, $C_{44}H_{62}O_4$, 80–90 p. c., pinic and sylvic acids. By shaking rosin with warm diluted alcohol, abietic anhydride is converted into abietic acid, $C_{44}H_{64}O_5$, which is crystalline, soluble in carbon disulphide, benzene, alcohol, ether, chloroform, alkalies, glacial acetic acid. When boiled with alkaline solutions get greasy salts of abietic acid = rosin soap; if distilled with superheated steam get benzene and toluene.

PREPARATIONS.—I. OIL: 1. *Oleum Terebinthinæ Rectificatum.* Rectified Oil of Turpentine. (Syn., Fr. Essence de Térébenthine rectifiée; Ger. Gereinigtes Terpentinöl.)

Manufacture: Oil of turpentine 1 volume, lime water 6, shake, then distil. It is a thin, colorless, neutral liquid, sp. gr. 0.860, boils at 160° C. (320° F.). Dose, stimulant, diuretic, ♏v–30 (.3–2 Cc.), anthelmintic, ʒss–4 (2–15 Cc.).

Prep. *Terpini Hydras.* Terpin Hydrate, $C_{10}H_{18}(OH)_2 + H_2O$. (Syn., Ger. Terpinum Hydratum, Terpinhydrat.)

Manufacture: Rectified oil of turpentine 4 parts, alcohol 3, nitric acid 1, are mixed in a shallow porcelain dish and allowed to stand 3–4 days. Crystals form which are collected, drained, dried on paper and recrystallized from cold alcohol. It is the hydrate of the diatomic alcohol terpin; occurs in colorless, lustrous, rhombic prisms, nearly odorless, aromatic, bitter taste, permanent, soluble in 250 parts water, 10 alcohol, 2 boiling water, 100 ether; yield 12 p. c. (as to oil taken). *Impurities:* adhering acid. Dose, gr. 2–15 (.13–1 Gm.).

2. *Linimentum Terebinthinæ.* Turpentine Liniment. (Syn., Fr. Liniment Térébenthiné; Ger. Terpentinliniment.)

Manufacture: Oil of turpentine 35 Gm., resin cerate 65. Melt latter on water bath and add the former.

3. *Terebenum.* *Terebene,* $C_{10}H_{16}$. (Syn., Fr. Terebène; Ger. Tereben.) A liquid consisting chiefly of dipentene and terpinene with some cymol and camphene.

Manufacture: Oil of turpentine 20 parts, sulphuric acid 1. Add gradually the latter to the former, neutralize with chalk and distil.

It is a colorless or yellowish, thin liquid, agreeable, thyme-like odor, aromatic, terebinthinate taste, sp. gr. 0.855, soluble in equal volume alcohol, glacial acetic acid, slightly in water, optically inactive; should be kept cool, dark, in well-stoppered bottles. *Impurities:* acids, unaltered oil of turpentine, resinous matters. Dose, ♏v–15 (.3–1 Cc.).

4. *Ceratum Cantharidis,* 15 p. c.; externally.

II. RESIN: 1. *Ceratum Resinæ.* Resin Cerate. Basilicon Ointment. (Syn., Unguentum Resinæ—Tetrapharmacum; Fr. Cérat (Onguent) de Résine Anglais; Ger. Harzsalbe, Königssalbe, Zugsalbe.)

Manufacture: 35 p. c. Resin 35 Gm., yellow wax 15, lard 50.

Prep. 1. *Linimentum Terebinthinæ,* see page 68.

2. *Emplastrum Resinæ.* Resin Plaster. (Syn., Adhesive Plaster; Fr. Emplâtre résineux (adhésif); Gr. Heftpflaster.)

Manufacture: 14 p. c. Resin 14 Gm., lead plaster 80, yellow wax 6.

Preps. 1. *Ceratum Cantharidis,* 18 p. c.
2. *Emplastrum Arnicæ,* 67 p. c.
3. *Emplastrum Belladonnæ,* 40 p. c.
4. *Emplastrum Capsici,* q. s. to harden oleoresin; all externally.

PROPERTIES. 1. TURPENTINE AND OIL.—Internally stimulant, carminative, cathartic, anthelmintic, hæmostatic, expectorant, diuretic, diaphoretic, antipyretic. Externally rubefacient, irritant, counter-irritant, antiseptic, disinfectant. Mostly all due to volatile oil. It contracts vessels, increases peristalsis, gastric secretion, stimulates heart, depresses nervous system. Large doses produce gastro-enteritis, vomiting, diarrhœa, suppresses urine, gives lumbar pains, urethral burning, hæmaturia, strangury, insensibility, death by paralyzed respiration. It is excreted by the skin, bronchi, and kidneys; inhaling vapors give nasal, ocular, and renal irritation.

II. TERPIN HYDRATE.—Antiseptic (arresting tubercle bacilli), expectorant, diuretic, diaphoretic.

III. TEREBENE.—Stimulant, disinfectant, expectorant, astringent.

IV. RESIN.—Antiseptic, slight stimulant.

USES. 1. TURPENTINE AND OIL: Internally.—Chronic bronchial catarrh, cystitis, gonorrhœa, leucorrhœa, gleet, chronic urinary troubles, piles, hemorrhages, puerperal fever, inflammation of bowels, traumatic erysipelas, intestinal worms, pneumonia, phosphorus poisoning (old oil). Externally—rheumatism, sciatica, lumbago, neuralgia, bronchitis, pleurisy, peritonitis, tympanites, renal colic, gangrene, sprains, wounds, scabies, ringworms, enlarged glands, burns, frost bites, colic; vapors of oil in whooping-cough, diphtheria, laryngitis. Often associated with various liniments, chloroform, camphor, olive oil, narcotic extracts, etc. Give oleoresin in pill form, hardened with magnesia, or the oil dropped on sugar or emulsified.

II. TERPIN HYDRATE.—Acute and chronic bronchitis, whooping-cough, chronic nephritis, chronic cystitis, gonorrhœa.

III. TEREBENE.—Chronic bronchitis by inhalation and on sugar.

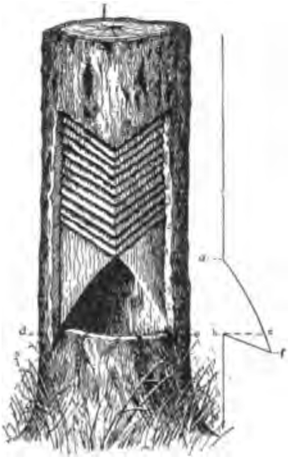
IV. RESIN.—Indolent ulcers, sores, wounds, in plasters, ointments, as emulsifying agent, chronic enteritis.

Allied Products:

1. **Pix Liquida. Tar,** *official.*—(Syn., Resina Empyreumatica Liquida; Fr. Goudron Végétal; Ger. Theer, Holztheer.) An empyreumatic oleoresin from the destructive distillation of the wood of *Pinus palustris* and other species of *Pinus* (*P. Tæ'da, P. ri'gida, P. sylve'stris* and *La'rix sibi'rica*).

Obtained by cutting refuse pine wood into billets, which are then stacked closely upon one another and covered with earth; the wood is set on fire from an aperture left at the apex, and slow combustion without flame allowed to proceed. At the bottom a ditch serves to run off the tarry liquid, whence it is ladled into barrels; the wood is converted into charcoal. In Europe permanent clay furnaces are used over and over. Tar is a true, impure turpentine, thick, viscid, semifluid, blackish; acrid, terebinthinate odor; sharp, empyreumatic taste, slightly soluble in water; soluble in alcohol, fixed and volatile oils, potassa and soda solutions; by age separates granular crystalline pyrocatechin.

FIG. 16.



A boxed, cornered and chipped pine tree.

CONSTITUENTS.—Acetic acid, small quantities of formic, propionic, capronic acids, acetone, methylic alcohol, mesit, toluol, xylol, cumol, methol (all passing over with the light oil of tar), naphthalin, pyrene, chrysene, paraffin, phenols, creosote (25 p. c.), pyrocatechin, empyreumatic resin. Dose, gr. 5–30 (.3–2 Gm.) in pill.

PREPARATIONS.—1. *Syrupus Picis Liquidæ.* Syrup of Tar. (Syn., Syrupus Piceus; Fr. Sirop de Goudron; Ger. Theersirup.)

Manufacture: Triturate tar 7.5 Gm., white sand 10, with water 15 Cc., reject liquid, to residue add boiling water 40, then glycerin 10, after 24 hours add filtrate to sugar 80 Gm., heat, add distilled water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

2. *Unguentum Picis Liquidæ.* Tar Ointment. (Syn., Fr. Pomatum Cum Pice, Pommade de Goudron; Ger. Theersalbe.)

Manufacture: 50 p. c. Tar 50 Gm., yellow wax 12.5, lard 37.5.

3. *Oleum Picis Liquidæ.* Oil of Tar. (Syn., Fr. Huile Volatile de Goudron; Ger. Theeröl.) A volatile oil distilled from tar. It is an almost colorless liquid when fresh, but by age becomes dark reddish-brown; strong tarry odor and taste, sp. gr. 0.970, soluble in alcohol. This can be made into a water and pills.

PROPERTIES.—Tar similar to oil of turpentine, but milder, scarcely ever vesicates, stimulant, expectorant, counter-irritant, insecticide. Internally—disturbs digestion, large doses may cause vomiting, colic, pain, headache, dark urine similar to carbolic acid.

USES.—Internally. Bronchitis, phthisis, vesical catarrh, constipation. Externally.—Scabies, scaly eruptions, eczema, burns, boils, sores, ulcers, gangrene, fissured nipples, hemorrhoids; fumes destroy foul odors.

Allied Turpentines:

1. *European Turpentine* from *P. Pina'ster*, *P. Lari'cio*, *P. sylves'tris*, *P. rotunda'ta* and other allied species; similar to our official.

2. *Chian Turpentine*, *Terebinthina Chia* (*Pista'cia Terebi'nthus*), from Island of Chio or Scio. It is a greenish-yellow liquid, hardens to transparent mass, odor fennel-like, terebinthinate, taste mildly bitter. Once used for uterine cancer, but now in disfavor. Dose, gr. 20 (1.3 Gm.).

Allied Plants:

1. *P. Tæ'da*, *Loblolly*, *Old Field* or *Frankincense Pine*.—Delaware, Florida, thence Texas, Arkansas. Grows along with *P. palustris* and is also a large tree 18–30 M. (60–100°) high, but leaves (15–25 Cm.; 6–10′ long) and cones (7.5–12.5 Cm.; 3–5′ long) are smaller. This yields not near so great per cent. of oleoresin as official plant, but one quite as good,. consequently it is utilized for this and other purposes.

2. *P. sylve'stris*, *Wild Pine* (*Scotch Fir*).—Europe. Tree 21–24 M. (70–80°) high, leaves and cones only 5–7.5 Cm. (2–3′) long; this yields much of the common European turpentine. *P. Pina'ster* (*P. mari'tima*). S. Europe. Much used for obtaining turpentine, pitch, tar.

TEREBINTHINA CANADENSIS. CANADA TURPENTINE.

Abies balsamea, (*Linné*) *Miller.* } A liquid oleoresin.

Habitat. Canada, N. United States to Virginia, west to Minnesota.

Syn. Fir Balsam Tree, Balm of Gilead Fir, Balsam Spruce, Hemlock Fir, Balsam Poplar, American Silver Fir, Canada Balsam, Balsam of Fir, Balsamum Canadense. Fr. Térébenthine du (Baume de) Canada, Térébenthine. Ger. Canadischer Terpentin.

A'bi-es. L. fir tree; *i. e.*, classic name, Gr. *ἐλάτη*.

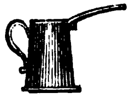
Bal-sam'e-a. L. of balsam, balsamic; *i. e.*, has the nature of balsam.

PLANT.—Beautiful and ornamental tree of damp woods, mountain swamps, 9–15 M. (30–50°) high; at high elevations a low shrub, branches numerous, giving tree a pyramidal shape; bark smooth, reddish-gray when young, filled with blisters (reservoirs) containing the balsam; leaves 2 Cm. (⅘′) long, linear, silvery beneath; flowers—staminate in catkins, pollen bright-yellow—pistillate in cones, bluish, solitary, 5–10 Cm. (2–4′) long, 2.5 Cm. (1′) thick; seeds with a large wing. OLEORESIN (Canada turpentine), yellowish or faintly greenish, transparent, viscid liquid; agreeable terebinthinate odor; bitter, slightly acrid taste. On exposure gradually dries, forming transparent mass; soluble in ether, chloroform, benzene. Dose, gr. 15–60 (1–4 Gm.).

Impurities.—Rosin dissolved in oil of turpentine and flavored with oil of wormwood (Factitious Oregon Balsam of Fir).

Commercial.—Canada turpentine is mostly from Canada; it is obtained by balsam gatherers, who, with families, encamp yearly in woods for two months. This turpentine secretes in vesicles of the bark, which, when pierced by the sharp-pointed nozzle of the "balsam-collector's can," readily empty their contents into the cans. Each tree yields about 8 ozs. (.24 Kg.), and a family can collect a gallon (4 L.) daily. Retapping occurs every 2–3 years, each time yielding less; the largest crop in Laurentine Mountains, Quebec, in a single year was 5,000 gallons (19,000 L.).

FIG. 17.



Can for collecting balsam of fir.

CONSTITUENTS.—Volatile oil, $C_{10}H_{16}$, 24 p. c., uncrystallizable resin (rosin), 75 p. c., four-fifths being soluble in boiling alcohol, one fifth in ether only, bitter principle (soluble in water).

PREPARATION.—1. *Collodium Flexile,* 5 p. c.; externally.

PROPERTIES AND USES.—Like oil of turpentine, except this dries into an adhesive varnish, thus acting as a protective.

Allied Plants:

1. *A. Fra'seri.*—Resembles official, but cones only 5 Cm. (2′) long, sharp-pointed scales projecting and recurved. New England, North Carolina, in mountains; used for collecting balsam of fir.

2. *A. Pi'cea* (*pectina'ta*), *Strassburg Turpentine* (*Terebinthina Argentoratensis*).—Vosges. Obtained like Canada balsam, chiefly differing in odor (lemon); taste bitter, not acrid; completely soluble in absolute alcohol.

3. *A. Menzie'sii, Oregon Balsam of Fir.*—This resembles Canada Balsam when fresh, but becomes gradually granular and opaque.

4. *Lar'ix Laxix* (*L. europæ'a, Pinus Larix*), *Venice Turpentine* (*Terebinthina Veneta*).—Obtained from heart-wood by bore holes; yellowish-green, transparent, fluorescent, odor terebinthinate, balsamic, soluble in alcohol.

PIX BURGUNDICA. BURGUNDY PITCH.

Abies Abies, (*Linné*) *Rusby.* }
(**A. excelsa,** *De Candolle.*) } The prepared resinous exudation.

Habitat. S. Europe. Burgundy province, France, mountains.

Syn. Norway Spruce, Norway Pine-, Spruce Fir, Thus Tree, Galipot or Burgundy Pitch Tree, Barras, American Frankincense. Fr. Poix (de Bourgogne)-, jaune-, blanche-, des Vosges. Ger. Burgunder Harz (Pech).

Ex-cel'sa. L. *ex,* out, + *cellere,* raised, lofty; *i. e.,* trees the highest.

PLANT.—Lofty tree, 24–45 M. (80–150°) high, .6–1.5 M. (2–5°) thick; leaves short, 4-cornered, dusky green, shining; flowers—staminate, purple, axillary, aments—pistillate, purple, terminal; fruit purple, cylindrical strobiles, scales oval, pointed, ragged edges. RESIN (Burgundy pitch), yellowish-brown, opaque or translucent, hard, but takes the shape of container, brittle, with a shining, conchoidal fracture, aromatic, soluble in boiling alcohol, glacial acetic acid.

Commercial.—This resin is also obtained from *A. Pi'cea,* European silver fir. It exudes spontaneously and is also collected by removing portions of bark in blocks, thus laying bare the wood, or perpendicular grooves are cut, and the exuding concrete resinous matter upon the surface of the wound is detached by iron instruments, melted with water in boilers and strained through coarse cloths. A factitious variety of different odor is made by melting together common pitch, rosin, turpentine and agitating with water to give yellowish color.

CONSTITUENTS.—Volatile oil, $C_{10}H_{16}$, in varying proportions, resin (chiefly abietic acid), water, pimaric acid (isomeric with sylvic acid).

Volatile Oil, contains bornyl (terpinyl acetate), 11 p. c., pinene, borneol, etc.

PREPARATIONS.—1. *Emplastrum Picis Burgundicæ*. Burgundy Pitch Plaster. (Syn., Fr. Emplastrum Picatum, Emplâtre de Poix de Bourgogne; Ger. Burgunder Pech-Pflaster.)

Manufacture: 80 p. c. Burgundy pitch 80 Gm., olive oil 5, yellow wax 15. Melt pitch and wax together, then incorporate oil.

2. *Emplastrum Picis Cantharidatum.*—Cantharidal Pitch Plaster. (Syn., Emplastrum Calefaciens, Warming Plaster; Fr. Emplâtre de Poix Cantharidé; Ger. Pechpflaster mit Canthariden.)

Manufacture: 92 p. c. Cerate of cantharides 8 Gm., Burgundy pitch q. s. 100. Heat cerate, strain, melt pitch in strained liquid.

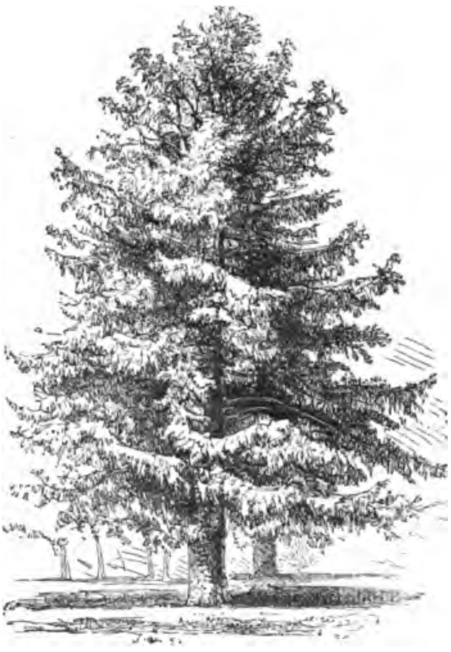
3. *Emplastrum Ferri*, 14 p. c.; externally.

4. *Emplastrum Opii*, 18 p. c.; externally.

PROPERTIES. — Externally stimulant, counter-irritant.

USES.—Mainly in plasters as a base and for support. Rheumatism, joint affections, chest troubles, pleurisy, bronchitis, catarrh, asthma, hepatitis, phthisis, pneumonia.

FIG. 18.



Abies Abies (excelsa).

Allied Plants and Products:

1. *Pini'tes succi'nifer* (*Pi'cea succini'fera*), *Succinum* (*Amber*).—A fossil resin, official, 1820–1860. Baltic Sea, Prussia, coal mines. There are 50 Pinaceæ species that yield this resin. Such trees have been submerged under sea water, and from time to time yield by natural exudation this oleoresin, which is found along shores under and above water in irregular sized pieces, that of 13 lbs. (6 Kg.) being, so far, the largest; it is rough, dull, hard, brittle, fracture conchoidal, glossy, transparent, yellowish-red, sp. gr. 1.09, aromatic when heated, taste-

less, melts at 288° C. (550° F.), yielding succinic acid, if heated higher get water, volatile acids, empyreumatic oil. Contains succinic acid, $C_4H_6O_4$, several resins. Used for preparing succinic acid and (empyreumatic) oil of amber, for fumigation, in the arts.

Oleum Succini, official, 1820–1860.

Oleum Succini Rectificatum, official, 1820–1890. Used as stimulant, antispasmodic, diuretic for hysteria, whooping-cough, infantile convulsions, intestinal irritation, amenorrhœa. Externally—rheumatism rubefacient liniments. Dose, ♏v–15 (.3–1 Cc.).

2. *Tsu'ga (A'bies) canaden'sis*, *Pix Canadensis* (*Canada Pitch, Hemlock Pitch*).—Prepared resinous exudation, official, 1840–1890. N. America. Hemlock spruce is an evergreen tree 18–24 M. (60–80°) high, .6–1 M. (2–3°) thick, trunk straight, uniform size for 12–15 M. (40–50°), bark rough; leaves 18 Mm. ($\frac{3}{4}'$) long, 2 Mm. ($\frac{1}{12}'$) wide, in two rows, numerous, glaucous, silvery beneath, cones ovate, 2.5 Cm. (1′) long, resin (oleoresin) reddish-brown, translucent, or opaque, nearly hard, brittle, fracture shining, conchoidal; odor mild, balsamic, terebinthinate. Oleoresin is obtained by exudation, incision or boxing; yield small. Used as stimulant, irritant, in plasters.

Emplastrum Picis Canadensis, official, 1860–1890.

3. *A'gathis loranthifo'lia* (*Da'mmara*), *Dammar*.—E. India. A spontaneous resinous exudation, transparent, straw colored rounded masses, almost odorless and tasteless, fracture conchoidal. Contains resin of which 40 p. c. is insoluble in alcohol and 60 p. c. soluble; by distillation get terpene, $C_{10}H_{16}$. Used mostly in varnishes, rarely in plasters. That from New Zealand—*Kauri Resin*, is also found fossil and often sold as copal.

4. *Calli'tris quadriva'lvis*, *Sandaraca* (*Sandarac*).—N. W. Africa. It is a resin which exudes spontaneously or from incisions made through the bark: occurs in elongated pale-yellow tears 5–15 Mm. ($\frac{1}{5}$–$\frac{3}{5}'$) long, covered with whitish dust, of a glass-like lustre, transparent, hard, brittle; odor and taste terebinthinate, balsamic, bitter, soluble in hot alcohol, ether; it resembles peas in size, often mixed with mastic, owing to its cheapness, but distinguished by being pulverulent when chewed (and not adhesive as with mastic), contains three resins, differing in solubility, also bitter principle; mild stimulant. Mainly used in varnishes.

JUNIPERUS. JUNIPER.

Oleum Juniperi. Oil of Juniper. *Official.*

Juniperus communis, *Linné.* } A volatile oil distilled from the fruit.

Habitat. N. America, Canada, N. United States, Asia, Europe, N. Africa, dry woods, hills.

Syn. Juniper Bush or Berries, Fructus (Baccæ) Juniperi. Fr. Genièvre, Baies de Genièvre. Ger. (Gemeiner) Wachholderbeeren. Oil of Juniper Berries, Oleum Fructus (Baccæ) Juniperi. Fr. Essence de Genièvre. Ger. Wachholder(beer)öl.

Ju-nip′e-rus. L. fr. Celtic *juniperus*, rough—*i. e.*, its foliage; or fr. L. *juvenis*, young, + *parere*, to produce—*i. e.*, young fruit, leaves, etc., are continually replacing the old.

Com-mu′nis. L. common, general—*i. e.*, the usual or ordinary kind.

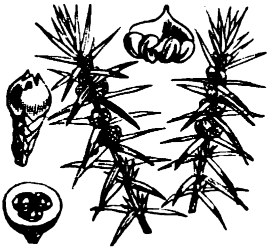
PINACEÆ.

PLANT.—Evergreen shrub 2–5 M. (6–15°) high, with many close branches, some often prostrate; leaves narrow, longer than fruit, 12 Mm. (½′) long, in whorls of 3's, sharp-pointed, channelled, deep-green; flowers diœcious—staminate catkins, pistillate cones; fruit (galbulus) roundish berry, 8 Mm. (⅓′) broad, dark purplish with bluish-gray bloom, 3-rayed, pulpy, 3-seeded, oil glands on surface, ripens second year; odor and taste terebinthinate.

CONSTITUENTS.—Volatile oil ½–2 p. c., sugar 30 p. c., resin 10 p. c., juniperin, proteids 4 p. c., fat, wax, malates, formic and acetic acids.

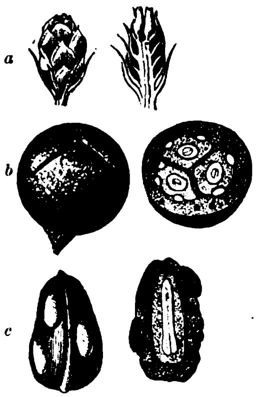
Oleum Juniperi. Oil of Juniper.—Obtained from the fruit by distillation with salt and water, or steam; it is a greenish-yellow liquid, darker, thicker by age; odor of juniper, warm, terebinthinate, bitter taste, levogyre, sp. gr. 0.875. Contains chiefly pinene, $C_{10}H_{16}$, with some cadinene, $C_{15}H_{24}$, and an ester to which odor and taste are due; fulminates with iodine, soluble in 4 volumes alcohol with turbidity. Should be kept dark, cool, in well-stoppered bottles. Dose, ♏v–15 (.3–1 Cc.).

FIG. 19.



Juniperus communis.

FIG. 20.



Juniperus; *a*, fertile catkin and longitudinal section; *b*, galbulus and transverse section; *c*, seed and longitudinal section magnified.

PREPARATIONS.—1. *Spiritus Juniperi.* Spirit of Juniper. (Syn., Fr. Alcoolat (Esprit) de Genièvre; Ger. Wachholderspiritus.)

Manufacture: 5 p. c. Oil 5 Cc. dissolved in alcohol 95 Cc. Dose, ʒj–4 (4–15 Cc.).

2. *Spiritus Juniperi Compositus.* Compound Spirit of Juniper.

Manufacture: ⅖ p. c. Oil 4 Cc., oil caraway, .05, oil fennel, .05, alcohol 70, water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

Unoff. Preps. Fruit: *Fluid Extract.* Dose, ʒj–2 (4–8 Cc.). *Extract.* Dose, gr. 10–30 (.6–2 Gm.). *Infusion,* 5 p. c. Dose, ʒss–2 (15–60 Cc.).

PROPERTIES.—Similar to turpentine; stimulant, diuretic, anodyne, emmenagogue, carminative, stomachic, antiseptic.

USES.—Renal dropsy, urinary catarrh, rheumatic pains, swellings.

JUNIPERUS OXYCEDRUS. PRICKLY CEDAR.

Oleum Cadinum. Oil of Cade (Oleum Juniperi Empyreumaticum), *official.*

Juniperus Oxycedrus, *Linné.* } Volatile oil distilled from the wood.

Habitat. S. Europe, Spain.

Syn. Large brown-fruited Juniper; Juniper Tar Oil. Fr. Huile de Cade. Ger. Kade Oel.

Ox-y-ce′drus. L. fr. Gr. ὀξύς, sharp, pointed, + κέδρος, cedar; *i. e.*, cedar with pointed leaves.

Plant.—Shrub 2.4–3.7 M. (8–12°) high, resembling *J. communis*, branches spreading, drooping; leaves medium size, awl-shaped, pointed, two furrows on upper edge; fruit 12 Mm. (½′) thick, reddish, shining, two white lines on apex.

Oleum Cadinum. Oil of Cade.—Should be dry distilled from heart-wood; it is dark-brown, clear, thick liquid, tarry odor, burning, empyreumatic, bitter taste, sp. gr. 0.990; contains phenols and sesquiterpene—cadinene, $C_{15}H_{24}$. Partly soluble in alcohol, completely in ether, chloroform, carbon disulphide. The oil from *J. communis* wood often substituted. Dose, ♏iij–5 (.2–.3 Cc.).

Properties.—Anthelmintic, externally parasiticide.

Uses.—Psoriasis, pityriasis rubra, chronic eczema, prurigo, psora, favus. This oil can be substituted for official *Oleum Picis Liquidæ*, both having about the same effect.

SABINA. SAVINE.

Juniperus Sabina, *Linné.* } The tops.

Habitat. Siberia, Europe, Canada, N. United States (Me. to Wis.), rocky banks.

Syn. Savin, Shrubby Red Cedar. Br. Sabinæ Cacumina, Savine Tops. Fr. Sabine. Ger. Summitates (Herba) Sabinæ, Sevenbaum, Sadebaumspitzen, Sevenkraut.

Sa-bi′na. L. *sabinus*, of the Sabines, town and people of ancient Italy, next the Latins, who used this juniper as incense.

Plant.—Evergreen procumbent or erect shrub, 1–4.5 M. (3–15°) high, compact, spreading by many divided branches; bark pale reddish-brown, scaling off, that of young branches light-green, adhering; leaves many, small, erect, pointed, glandular in middle, imbricated in 4 rows; flowers May–June, diœcious, staminate in catkins, pistillate small cones; fruit (galbulus, coalesced scales) berry-like, size of a pea, bluish-purple, whitish bloom, soft, enclosing 1–3 seeds. Tops, short, thin, yellowish-green, subquadrangular branchlets; leaves opposite, dark-green, scale-like, ovate-lanceolate, acute, appressed, on the back a shallow groove, containing oblong or roundish gland; odor peculiar, terebinthinate; taste nauseous, resinous, bitter. *Solvents:* boiling water; alcohol. Dose, gr. 5–15 (.3–1 Gm.); in syrup or honey.

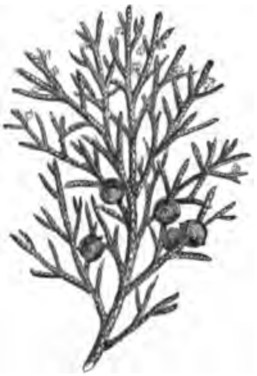
Commercial.—Savin grows in Switzerland, Germany, France, Austria, Spain, Italy at 1,500 M. (5,000°) or greater elevations, especially hugging the Alps. In Asia it follows the Caucasus 3,600 M. (12,000°) elevation. It was grown in English gardens as early as

1550; not much cultivated now. Tops are collected in spring, and young, green shoots separated from woody branches. By microscope can detect, in coarse powder even, the bordered pits so characteristic of gymnospermous wood cells, hence this is of importance in poison cases.

CONSTITUENTS.—Volatile oil 1½–2½ p. c., resin, tannin.

Oleum Sabinæ. Oil of Savine, *official*.—(Syn., Fr. Essence de Sabine; Ger. Sadebaumöl.) This volatile oil is obtained by distilling fresh branches with water or steam; yields 1½–2½ p. c.; if fresh berries used, get 8–10 p. c. of inferior oil. It is colorless or yellowish; terebinthinate odor; taste pungent, bitter, camphoraceous, darkens and thickens by age, sp. gr. 0.930, contains chiefly pinene, $C_{10}H_{16}$, also cadinene, $C_{15}H_{24}$. *Test:* Soluble in equal volume alcohol (dif. from oil of juniper and oil of turpentine); should be kept in the dark. Dose, ♏j–5 (.06–.3 Cc.).

FIG. 21.



Juniperus Sabina.

PREPARATIONS.—1. *Extractum Sabinæ Fluidum.* Fluid Extract of Savine. (Syn., Fr. Extrait liquide de Sabine; Ger. Flüssiges Sadebaum-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–15 (.3–1 Cc.).

Unoff. Preps.: Extract. Dose, gr. 1–4 (.06–.26 Gm.). *Tincture.* Dose, ʒj–2 (4–8 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). *Cerate* (fluid extract 25 + resin cerate 90; to latter melted add former, evaporate off alcohol). *Ointment.*

PROPERTIES.—Diuretic, emmenagogue, ecbolic, irritant, hæmagogue, vermifuge. Oil is similar to but more powerful than oil of turpentine, irritating ovaries (accelerating menstruation) and uterus (inducing contractions). Large doses produce vomiting, purging, abortion, severe pain, rupture of gall bladder, death.

USES.—Amenorrhœa, dysmenorrhœa, menorrhagia, sterility, chlorosis, chronic rheumatism, gout; externally powder or infusion applied to warts, indolent ulcers, dental caries, tinea capitis, polypi, venereal condylomata. Cerate prolongs secretion from blisters, stimulates healing of gangrenous ulcers, often combined with burnt alum, cupric subacetate. Oil is the best internal form, which should be given in emulsion, pill, or alcoholic solution. *Poisoning:* Give magnesium sulphate (full dose), demulcents, anodynes, stimulants.

Allied Plants:

1. *J. virginia'na, Red Cedar.*—The tops official, 1820–1880. United States. Slow growing evergreen, 6–24 M. (20–80°) high, 15–45 Cm. (6–18′) thick, branches spreading, horizontal near the ground, leaves small, glandular, ternate in pairs, only differs from *J. Sabina* in habit, smaller, erect fruit, leaves more acute, interior wood reddish,

durable, sapwood yellowish, branchlets bear excrescences (cedar apples), anthelmintic. Dose, gr. 10–30 (.6–2 Gm:) ter die; odor peculiar; taste pungent. Contains volatile oil, resin, tannin. The wood gives volatile oil red cedar, which contains cedrene camphor, $C_{15}H_{26}O$, + cedrene, $C_{15}H_{24}$. Both tops and volatile oil can be substituted for the official, but are weaker.

2. *Thu'ja occidenta'lis*, *Arbor Vitæ* (*White Cedar*).—The fresh tops official, 1880–1890. Canada, United States. Tree resembles closely *Chamæcy'paris sphæroi'dea* (*Cupres'sus thyoi'des*), 6–15 M. (20–50°) high, trunk crooked, bark pale, shreddy, wood light, soft, durable; leaves 4 rows, rhomboid-ovate, pointed, roundish gland on the back, balsamic, terebinthinate odor; pungent, camphoraceous, bitter taste; twigs flattish, contains volatile oil 1 p. c.; resin, tannin, pinipicrin, thujin, thujigenin. Used as stimulant, diuretic, irritant for intermittents, coughs, fevers, scurvy, rheumatism, amenorrhœa, dropsy, worms, pulmonary catarrh, ulcers, warts; in infusion, decoction, fluid extract. Dose, gr. 15–60 (1–4 Gm.).

CLASS ANGIOSPERMÆ (Seeds clothed, enclosed in an ovary).

SUB-CLASS MONOCOTYLEDONES (Embryo with one cotyledon, stem endogenous, leaves paralled-veined).

7. GRAMINACEÆ. Grass Family.

Gram-i-na'se-e. L. fem. pl. of *gramineus*, of or pertaining to grass —*gramen*, grass. Herbs, shrubs, or arborescent plants, largest endogenous order except Orchidaceæ. Distinguished by having leaves 2-ranked with split sheaths and ligule; stems (culms) hollow, closed at joints; flowers glumaceous, paleæ (chaff, husk) 2, stamens 3, hypogynous. Anthers versatile; ovary superior, ovule 1; fruit caryopsis, stigmas feathery, hairy; universal; purgative, poisonous, cereals, fodder, sugar, volatile oil.

Genera: 1. **Zea.** 2. **Saccharum.** 3. **Agropyron.**

ZEA MAYS. INDIAN CORN.

1. ZEA. Zea (Corn Silk).

2. AMYLUM. Starch.

Zea Mays, *Linné.* } 1. The styles and stigmas. 2. The fecula of the seed.

Habitat. S. America, cultivated in warm temperate zones.

Syn. Corn, Indian or Turkish Corn, Maize, Jagong, Stigmata Maydis, Corn Starch. Fr. Maïs, Filament de Maïs, Fécule (Amidon) de Maize. Ger. Mais, Maispistille, Stärke, Kraftmehl, Maisstärke.

Ze'a. L. fr. Gr. *ζάω*, to live; *i. e.*, from its life-supporting properties to beast and man.

Ma'ys. L. *maydis*, Sp. *maiz*, fr. *mahiz*, its native name in the Haytien Island language, its native habitat.

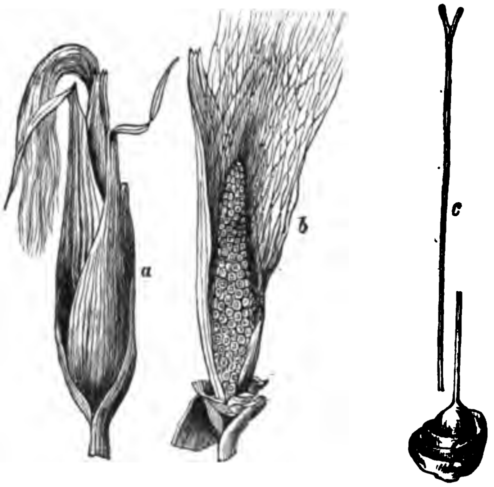
Am'y-lum. L. starch, Gr. *ἄμυλον* = *a*, not, + *μύλη*, a mill; *i. e.*, so fine as not requiring to be ground in a mill.

Starch fr. *stark*, strong, stiff, so called from its use in stiffening various substances.

PLANT.—An annual; stem 1.2–4.5 M. (4–15°) high, erect, stiff, unbranched, grooved on one side, smooth, solid, with spongy centre, jointed; roots fibrous; leaves many, linear, .6–1 M. (2–3°) long, 5–7.5 Cm. (2–3′) wide, channelled; the flowers monœcious—staminate spikelets numerous, in pairs, forming a long-stalked terminal panicle (tassel), —pistillate thick spikes from the husks of which project long slender styles and stigmas (silk); fruit, caryopsis (kernel) and the rachis (cob) form the spike (ear), which is enclosed by the bracts of the spathe (husks). Kernels (seed, grain) occur in 8–10–12 rows, or some even number = yellow, white, red or purple color.

STYLES AND STIGMAS, thread-like, 15 Cm. (6′) long, .5 Mm. ($\frac{1}{50}$′) thick, yellowish or greenish, soft-silky, finely hairy, delicately veined longitudinally; inodorous, sweetish. *Solvent:* boiling water. Dose, ʒss–2 (2–8 Gm.).

FIG. 22.



Zea Mays; *a*, spadiceous flower with styles protruding; *b*, the same freed from cover leaves, reduced in size; *c*, a single style with stigma.

FECULA OF THE SEED, occurs in irregular, angular masses, easily powdered, white, inodorous, tasteless, insoluble in ether, alcohol, or cold water; under the microscope in nearly uniform granules, irregularly angular in outline, usually polyhedric (5–6–7) or rounded, two-thirds the size of wheat starch, with indistinct striæ, and distinct slit-hilum near the centre. *Tests:* 1. When boiled with water get white jelly having bluish tinge; this when cool becomes deep-blue by adding iodine T. S. 2. With diluted acids or diastase get dextrin, $C_{12}H_{20}O_{10}$, and dextrose, $C_6H_{12}O_6$, which reveals the starch formula to be $(C_6H_{10}O_5)_3$. *Solvents:* water or glycerin by boiling. Dose, ʒss–2 (2–8 Gm.).

ADULTERATIONS.—With allied starches, especially of wheat and potatoes; all recognized by the microscope in the shape of the granules.

Commercial.—Corn silk is simply collected from the ears of corn and dried carefully in the sun. Starch is prepared from the grain, by soaking in hot water, to which sometimes an alkali is added, until the testa are softened, then grinding under water and washing it upon suitable sieves with water; by this means the fecula is suspended in the water, and will deposit when allowed to remain quiet in tanks for some hours. The gluten, when present, remains in the supernatant alkaline water or upon the sieve. When all the starch is deposited on the bottom the liquid is racked off, starch cut into blocks and carefully dried in regular chambers. The finely ground corn meal can also be kneaded under a running stream of water until milkiness ceases, and then allow the milky water to subside.

CONSTITUENTS.—I. CORN-SILK : Maizenic acid 2.25 p. c., fixed oil (oleum maydis), resin, sugar, mucilage, salts.

Maizenic Acid is soluble in water, alcohol, or ether. The oil is yellow, viscid, transparent, odor of corn meal, bland taste, demulcent.

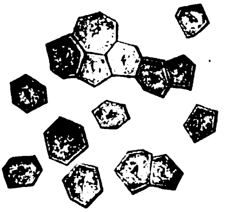
II. STARCH : $C_6H_{10}O_5$ or a multiple of this, ash 1 p. c.

PREPARATIONS.—1. *Glyceritum Amyli.* Glycerite of Starch. (Syn., Plasma, Glycamyl, Glycerin of Starch ; Fr. Glycéré d'Amidon, Glycérat Simple (d'Amidon) ; Ger. Unguentum Glycerini, Stärke-Glycerit.)

Manufacture: 10 p. c. Starch 10 Gm., water 10 Cc., glycerin 80 Cc.; heat and stir until a homogeneous, transparent jelly is formed.

Unoff. Preps.: I. CORN-SILK : *Fluid Extract.* Dose, ʒj–2 (4–8 Cc.). *Extract* (aqueous). Dose, gr. 5–10 (.3–.6 Gm.). *Decoction,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Syrup.* Maizenic acid. Dose, gr. ⅛ (.008 Gm.). II. STARCH : *Iodized Starch* (*Amylum Iodatum*) 95 p. c. + iodine 5, water q. s. for trituration ; then dry. Dose, ʒj–4 (4–15 Gm.).

FIG. 23.



Corn starch.

PROPERTIES.—I. CORN-SILK : Diuretic, lithontriptic, demulcent, anodyne, alterative, to disorders of genito-urinary passages and bladder.

II. STARCH : Nutritive, demulcent, protective absorbent.

USES.—I. CORN-SILK : Acute and chronic cystitis, uric acid and phosphatic gravel, gonorrhœa, cardiac stimulant in dropsy of heart disease.

II. STARCH : Mostly externally as a dusting powder to allay itching and burning of the skin in erythema, urticaria, erysipelas, smallpox, to saturate bandages for fractures, as an injection for inflamed rectum, bladder, as a vehicle for enemata, to harden pills, antidote to iodine-poisoning. Owing to starchy foods fermenting they should be avoided in fermentative dyspepsia.

Allied Starches:

While the official starch is a product from corn, hence called cornstarch, it must be borne in mind that there are many plants that also yield starch, but each kind peculiar to itself. This must not be accepted to infer total physical and chemical difference, because these in the main are uniform. It is only in the shape of the starch granules as viewed under a microscope that we recognize a varying form, and that this is characteristic alone for the source whence derived. Thus, when given a starch or mixture of starches, a small portion moistened with water and viewed under high power readily reveals its origin by the various outline granules. In this way (from their contained starch) it is possible to distinguish many official roots, rhizomes, seeds, fruits, etc., as it is also the cereals, edible fruits, and vegetables.

GRAMINACEÆ.

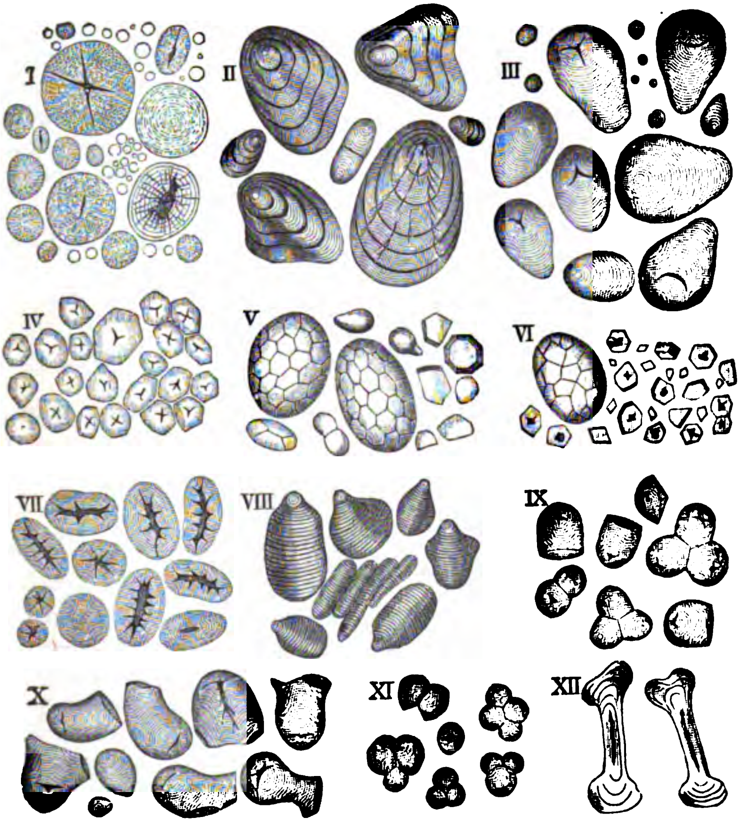
I. *Wheat Starch* (*Tri'ticum æsti'vum*). U. S. P., 1880. Lenticular, large and small granules, layers indistinct, hilum slight, near the centre.

II. *Potato Starch* (*Sola'num tubero'sum*). Ovate, granules unusually large, layers very distinct, hilum rather small and at the narrow end.

III. *Maranta Starch* (*Maran'ta arundina'cea*). Ovate granules, layers delicate, distinct, hilum at the broad end, often cleft.

IV. *Corn Starch* (*Ze'a Ma'ys*). Polyhedric granules, layers not easily distinguishable, hilum central, large.

FIG. 24.



Starch granules, magnified 475 diameters.

V. *Oat Starch* (*Ave'na sati'va*). Polyhedric granules often united in ovoid masses (compound), layers and hilum indistinct.

VI. *Rice Starch* (*Ory'za sati'va*). Polyhedric granules, uniform, similar but much smaller than corn starch, hilum very small.

VII. *Bean Starch* (*Phase'olus vulga'ris*). Ellipsoidal granules, layers distinct, crossed by fissures radiating from centre.

VIII. *Curcuma Starch* (*Cu'rcuma lon'ga*). Elliptic granules, flat, contracted at one end; layers numerous, delicate, hilum small, at narrow end.

IX. *Tapioca. Brazilian Arrow-root* [*Ma'nihot Manihot* (*utili'ssima*)]. *Cassava Starch.* Muller-shaped, layers indistinct, hilum near rounded end, often cleft.

X. *Sago. Pearl Sago* (*Metrox'ylon Ru'mphii* and *M. Sa'gu*). Ovate granules, one end truncate, layers more or less distinct, hilum at rounded end, often cleft.

XI. *Sarsaparilla Starch* (*Smi'lax officina'lis*). Roundish, compound, usually with cleft hilum.

XII. *Euphorbia Starch* (*Euphorbiaceæ Plantæ*). Elongated, bone-shaped nodular ends, layers distinct.

Derivative Product:

1. *Dextrinum, Dextrin,* $C_6H_{10}O_5$. Obtained by heating starch 204° C. (400° F.), in a cylinder or flat vessel; this yellowish product is often called in commerce *British Gum.* Can also make it by heating starch 110° C. (230° F.), with dilute nitric acid. It is a pale-yellow, amorphous, gummy mass, soluble in water, insoluble in alcohol or ether.

SACCHARUM. SUGAR (CANE SUGAR), $C_{12}H_{22}O_{11}$.

Saccharum officinarum, *Linné,* and various species of **Sorghum** and varieties of **Beta vulgaris,** *Linné.*	The refined sugar from these sources.

Habitat. S. Asia, cultivated in tropics and subtropics, Africa, E. and W. Indies, Cuba, Brazil, S. United States, especially Louisiana. The sugar beet in France, Germany. Cultivated in Kansas, California, Nebraska, Utah.

Syn. Br. Saccharum Purificatum, Sucrose. Fr. Sucre, Sucre de Canne, Sucre pur. Ger. Zucker, Rohrzucker, Weisserzucker.

Sac'cha-rum. L. sugar, Gr. *σάκχαρον* fr. Ar. *sukkar*, Hung, *zukur*, ML. *succarum* after *succus*, a juice, fr. Skt. *carkara*, candied sugar, orig. grit, gravel.

Of-fi-ci-na'rum. L. *officina*, workshop; *i. e.*, *opus*, work, +*facere*, to do, = of or belonging to the shop or store.

Sor'ghum. L. fr. *sorghi*, its native Indian name.

Be'ta. L. the beet, fr. Celtic *bett*, red, from the red color of the roots.

Vul-ga'ris. L. ordinary, common; *i. e.*, the kind most universally found wild.

PLANTS.—1. *Saccharum officinarum, Sugar Cane.* Perennial herb; rhizome thick, jointed, solid; roots fibrous; stems many, 2–4.5 M. (6–15°) high, 2.5–5 Cm. (1–2′) thick, jointed, solid, containing white juicy pith, and, according to variety, outside yellow, greenish-yellow, purple, or striped, joints 7.5 Cm. (3′) apart, giving rise to encircling leaves; leaves 1–1.2 M. (3–4°) long, 5 Cm. (2′) wide, flat, acuminate, white midrib, longitudinally striate, dentate; flowers pinkish, in large terminal panicles. There are several varieties, all more or less resembling our Indian corn. It is cultivated by cuttings, planted in rows, and, as they produce shoots easily, some five or six crops can be saved before replanting.

2. *Sorghum vulgare* var. *saccharatum, Broom Corn* (*Chinese Sugar Corn*). Root annual with culm 2–3 M. (6–10°) high, 12–25 Mm. (½–1′) thick, smooth, solid with pith, nodes tumid; leaves .6 M. (2°) long, 5–7.5 Cm. (2–3′) wide, linear, acuminate, pubescent at base; flowers in panicles.

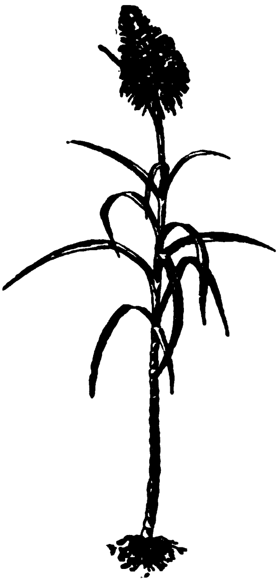
3. *Beta vulgaris, Common* or *Sugar Beet.* Chenopodiaceæ. Herb with biennial fleshy root 7.5–10 Cm. (3–4′) thick, 30–37.5 Cm. (12–

15′) long, conical, deep-purple or yellowish; stem .6–1.2 M. (2–4°) high, paniculately branched; leaves—radical 15–30 Cm. (6–12′) long, petioles 10–20 Cm. (4–8′) long—cauline smaller as nearing apex; flowers July–Aug., axillary clusters.

Sugar, white, dry, hard crystalline granules, sp. gr. 1.59, odorless, very sweet taste, soluble in 0.5 part water, 175 alcohol, 0.2 boiling water, saturated aqueous solution (syrup) dextrogyre with sp. gr. 1.345; by ferments in air or by boiling with dilute acids, syrup is converted into invert sugar (mixture glucose + levulose), which is then directly fermentable and reduces red cuprous oxide from alkaline solution of cupric oxide. Kept for a time at 180° C. (356° F.) it is converted into levulosane, $C_6H_{10}O_5$, and dextrose (glucose), $C_6H_{12}O_6$, without loss of weight. *Tests:* 1. Saturated solution upon long standing should not deposit sediment (abs. insoluble salts, ultramarine, Prussian blue). 2. 1 Gm. + 10 Cc. boiling water + 4–5 drops silver nitrate T. S. + 2 Cc. ammonia water, then quickly boiled, should have only slight coloration, no black deposit upon standing 5 minutes (abs. grape sugar or more than small amount of inverted sugar).

Adulterations.—Chiefly with inferior sugars whitened with ultramarine or Prussian blue.

Fig. 25.



Saccharum officinarum.

Commercial.—Cane sugar was first brought from India to Europe by Venetians during the Crusades. Used by ancients only as medicine. With discovery of Cape of Good Hope and sea route to E. Indies, the Portuguese secured control of the sugar commerce, and thus its cultivation was extended to Arabia, Egypt, Sicily, Spain, Canaries, America, W. Indies. It is manufactured by cutting ripe cane off near the ground, or pulling up and washing beet roots stripped of leaves, and passing these through iron roller presses in order to express the juice, which being run into shallow pans is boiled with lime (1 in 800); heat coagulates albumin, gluten, etc., which is skimmed off, lime neutralizes free acid and combines with albuminoids not coagulable by heat or acids, a part forming scum, the other a deposit. The thus clarified juice is drawn off into the boiler, evaporated, skimmed, and when sufficiently tenacious and granular is emptied into coolers to crystallize or grain. The concrete sugar is put into barrels with perforated bottoms, drained 3–4 hours or strongly agitated with wooden stirrers, causing granulation in six hours; it is yellow, and is now packed into hogsheads, being exported as *raw, open pan,* or *muscovado sugar,* the drainings constitute molasses. This sugar is refined by dissolving in water with steam, heating with bullocks' blood, filtering through canvas bags, percolating through large cylinders of animal charcoal, and evaporating the colorless percolate in steam vacuum pans at 77° C. (170° F.). When sufficiently concentrated it is run into conical moulds (centrifugals) having orifices closed; after solidification the stoppers are removed for draining (treacle), loaves are then sugared by pouring over them saturated syrup, which by slow infiltration passes through, carrying with it all coloring-matters, impurities, etc., without dissolving any crystallized sugar, thus giving *refined, vacuum pan,* or *loaf sugar.* Sugar can also be obtained from maple, birch, palm, etc.

CONSTITUENTS.—Sugar cane: Juice 80 p. c., which contains sugar 16–21 p. c., water 78–84 p. c., mucilage, resin, fat, albumin 0.3–0.4 p. c. Beets: Juice contains sugar 12 p. c., but only yields about 9 p. c.

PREPARATIONS.—1. *Syrupus.* Syrup. (Syn., Simple Syrup, Syrupus (Simplex) Sacchari; Fr. Sirop (de Sucre) Simple; Ger. Sirup, Weisser Sirup.)

Manufacture: Sugar 85 Gm., dissolve by heat in distilled water q. s. 100 Cc. Dose, *ad libitum.* This should have sp. gr. 1.317, and contains 64.54 p. c. by weight of sugar.

Preps.: 1. *Compound or Medicated Syrups* of various kinds, as well as into numerous other preparations as an ingredient.

2. *Troches* of various kinds. *Pulvis Cretæ Compositus, Pulvis Glycyrrhizæ Compositum, Pilulæ Ferri Carbonatis, Pilulæ Ferri Iodidi,* and many other preparations elsewhere mentioned.

PROPERTIES.—Demulcent, lenitive, stimulant, laxative, aliment, condiment, externally in certain ulcerations.

USES.—Chiefly as vehicle, corrigent, preservative, antiseptic, excipient. Syrups protect ingredients against putrefaction, not always against fermentation, prevent iron preparations from oxidation; in troches, powders, mixtures covers taste of nauseous medicines, rendering insoluble substances more miscible with water; in food nutrient to adipose tissue, and a respiratory fuel; diuretic on healthy kidneys, has no effect on the teeth, good in cough, hoarseness, hiccough, aphthæ, ulcers, wounds, corneal and eyelid granulation, chronic laryngitis, chronic ozæna (as snuff), ascarides (by injection), fumes destroy offensive effluvia.

Allied Products:

1. *Glucose, Grape Sugar (Dextrose, Starch Sugar),* $C_6H_{12}O_6$, or hydrated $C_6H_{12}O_6.H_2O$. Obtained from grapes, also the kind that glucosides form when decomposed, but largely made by boiling starch 100 parts + water 400 + sulphuric acid 4–5 until starch can no longer be detected. The free acid is now neutralized with chalk, filtrate clarified, decolorized with clay, charcoal, etc., and concentrated in vacuum pan. Occurs in yellowish-white masses, crystallizes with or without water, inodorous, about one-half as sweet as cane-sugar, soluble in 1 part water, sparingly in alcohol, usually contains glucose 60 p. c., dextrin 20 p. c., water 20 p. c., ash 0.3 p. c., cold aqueous solution dextrogyre; mixed with twice bulk alcohol get white precipitate if dextrin present;

with ammonium oxalate get white precipitate of the calcium sulphate. Liquid glucose contains dextrose 34–43 p. c., maltose 0–19 p. c., dextrin 30–45 p. c., water 14–23 p. c. Diluted solutions in water easily ferment, when heated with potassa are colored brown, speedily reduce red cuprous oxide from alkaline solution of cupric oxide and separate a metallic mirror from ammoniacal silver solution. With heat get caramel. Used like cane sugar.

2. *Fruit Sugar, Lævulose,* $C_6H_{12}O_6$.—This often accompanies grape sugar in fruits, honey, etc., sometimes in plants with cane sugar. It is usually a colorless uncrystallizable syrup, nearly as sweet as cane sugar, levogyrate, soluble in water. Can be produced from inulin by dilute acids; with nascent hydrogen yields mannit, with nitric acid is oxidized into succinic, acetic, and oxalic acids.

3. *Inosit, Phaseo-mannit,* $C_6H_{12}O_6.2H_2O$.—Found in juices of some meats, green fruits (Leguminosæ), asparagus, etc.; it is very sweet, crystallizes from water, alcohol; does not ferment, but with nitric acid yields explosive compounds and oxalic acid.

4. *Syrupus Fuscus, Molasses* (*Melasses*).—Official, 1860–1870. Have two kinds: 1. W. India; black, ropy, peculiar odor, sweet, empyreumatic taste. Yields by fermenting and distilling commercial rum, and is the kind once official. 2. Sugar House (Golden Drips, Grocer's Syrup). Same as preceding, only thicker, different flavor, often largely adulterated with glucose, sp. gr. 1.40, contains 75 p. c. solid matter. Both kinds have uncrystallizable sugar with some cane sugar which failed to crystallize out, also have gum, coloring matter. If these be boiled with strong solution potassium dichromate get violent reaction, green liquid; but if adulterated with one-eighth starch-sugar molasses, the reaction is wanting, color not changed.

Derivative Products:

1. *Rock Candy, Saccharum Crystallizatum.*—Heat concentrated cane sugar syrup, add spirit, and upon cooling, white, transparent, oblique, four-sided prisms form; this is the purest kind of sugar.

2. *Barley Sugar, Saccharum Hordeatum.*—Cane sugar melted carefully (185° C.; 365° F.) and suddenly cooled; it is amorphous, yellowish, transparent, gradually becomes crystalline and opaque externally.

3. *Caramel,* $C_{12}H_{18}O_9$.—This results from cane sugar parting with $2H_2O$ by being heated to 204° C. (400° F.) for a short time; it is dark brown, bitter, consisting of colorless, bitter caramelan, $C_{12}H_{18}O_9$, red-brown caramelene, and other compounds. The conversion is hastened by alkalies. Used in coloring liquid preparations.

TRITICUM. TRITICUM (COUCH-GRASS).

Agropyron repens, (*Linné*) *Beauvais.* } The rhizome gathered in the spring and deprived of the roots.

Habitat. Europe, N. America.

Syn. Shelly, Quack, Quick, Quitch, Twitch, Dog, Witch, Knot or Dog's Tooth Grass, Quitch, Quickens, Dogweed, Chiendent. Fr. Chiendent officinal, Petit Chiendent. Ger. Rhizoma (Radix) Graminis, Queckenwurzel, Grasswurzel.

Ag-ro-pyr′on (Agropyrum). L. fr. Gr. αγρός, a field, + πυρός, wheat; *i. e.*, grows wild in wheat fields.
Re′pens. L. fr. *repo*, creep, crawl; *i. e.*, stem inclines to crawl on the ground.
Trit′i-cum. L. fr. *tero, terere*, pp. *tritus*, thresh, rub, grind; *i. e.*, seeds must be ground for eating.

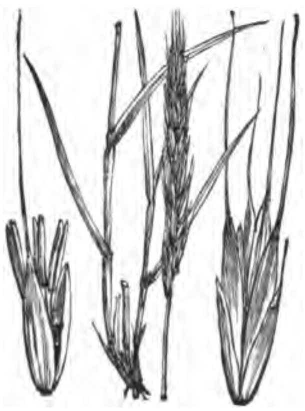
PLANT.—Perennial weed along roadsides and in cultivated grounds; culm .6–1.2 M. (2–4°) high; spikes compressed, 7.5–10 Cm. (3–4′) long; spikelets 3–8-flowered, 2-ranked, alternate on opposite sides of solitary, terminal spike; glumes transverse, lanceolate, herbaceous, 3–7-nerved; flowering glumes rigid, convex on back, 5–7-nerved, pointed or awned from tip; palet flattened, bristly ciliate. RHIZOME, very long, creeping, 2 Mm. ($\frac{1}{12}$′) thick, internodes 5 Cm. (2′) long; in shops cut into sections 8 Mm. ($\frac{1}{3}$′) long, smooth, wrinkled, hollow centre, straw-yellow, inodorous; taste sweetish. *Solvents:* cold or hot water. Dose, ʒss–3 (2–12 Gm.).

CONSTITUENTS.—Triticin 8 p. c., fruit sugar 2½–3½ p. c., inosit, glucose, mucilage, malates, ash; lactic acid and mannit are found in the extract as results of fermentation.

Triticin.—Gum-like substance resembling inulin, convertible into levulose. Obtained by exhausting with water, neutralizing with baryta, concentrating, precipitating with lead subacetate, removing lead, treating with charcoal, neutralizing, concentrating, precipitating with alcohol; it is an amorphous, white powder, inodorous, tasteless, deliquescent, with nitric acid oxidizes into oxalic acid.

PREPARATIONS.—1. *Extractum Tritici Fluidum.* Fluid Extract of Triticum. (Syn., Fr. Extrait liquide de (petit) Chiendent; Ger. Flüssiges Queckenwurzel Extrakt.)

FIG. 26.



Agropyron repens.

Manufacture: Exhaust 100 Gm. with boiling water by percolation, evaporate to 75 Cc., add alcohol 25; set aside, filter. Dose, ʒss–3 (2–12 Cc.).

Unoff. Preps.: Extract. Dose, gr. 10–20 (.6–1.3 Gm.). *Decoction*, 5 p. c. Dose, *ad libitum*. *Infusion*, 5 p. c. Dose, *ad libitum*.

PROPERTIES.—Diuretic, aperient, demulcent, vulnerary.

USES.—Cystitis, irritable bladder, dysuria, gravel, jaundice, bronchitis, skin diseases, gout, relieves thirst, allays fever, promotes urination. Large and frequent drinks once considered a blood purifier.

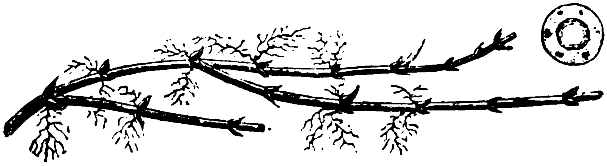
Allied Plants:

1. *Ave′na sati′va, Avenæ Farina* (*Oatmeal*).—The meal prepared from the seed, official, 1820–1880. Asia, Europe, cultivated. Plant .6–1.3 M. (2–4°) high, culm smooth, leaves linear, veined, rough, panicles loose, spikelets 2–3-flowered, paleæ (husk) cartilaginous. The grain ground gives oatmeal, if deprived of paleæ have groats. Oatmeal is not uniform, but is yellowish-white, gluten and husk present, bitter-

ish starch granules polyhedric, muller-shape. Composed of husk 25 p. c., grain 75 p. c.; the former contains fixed oil 1–1½ p. c., sugar and gum ½–¾ p. c., proteids 2 p. c.; the latter starch 64–66 p. c., fat 5–7 p. c., proteids 18–21 p. c. (mainly avenin), salts 1–3 p. c. Used as demulcent, laxative, dietetic, nutritive. The indigestible husks act as mechanical irritant, exciting peristalsis but may constipate by compaction. Given as porridge or gruel may ferment and injure digestion.

2. *Ho'rdeum di'stichon, Barley.*—The decorticated seed, official, 1820–1880. W. Asia, cultivated. Annual grain, culm .6–1 M. (2–3°) high, leaves linear, scabrous, spike 7.5–10 Cm. (3–4′) long, fruit in 2 rows, seed (pearl barley) elliptical, 12 Mm. (½′) long, flat back, angled sides, grooved front, smooth, grayish-yellow from adherent paleæ, when removed brownish. Contains starch 60–68 p. c., protein compounds (gluten, albumin) 12–16 p. c., oil 2–3 p. c., cellulose 8–12 p. c. Used as nutritive for bronchial affections, sore throat, febrile troubles, pulmonary and urinary disorders.

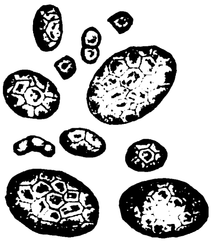
FIG. 27.



Agropyron repens ; rhizome and transverse section, magnified 3 diam.

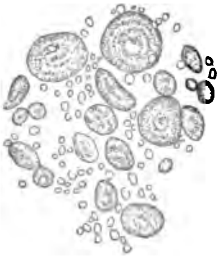
Maltum, Malt.—Official, 1880–1890. Barley seed having undergone incipient germination by soaking in water, heaping in piles, and allowing so to remain until the germ (acrospire) is ⅓ length of grain, then thoroughly drying to kill embryo. Contains diastase, dextrin, sugar, starch. The diastase converts starch into dextrin and sugar.

FIG. 28.



Oat starch ; magnified 250 diam.

FIG. 29.



Barley starch.

Malt Extract.—Official, 1880–1890. Simply an aqueous infusion evaporated. Good for dyspepsia, phthisis, wasting diseases; infusion used in wasting troubles, cholera infantum, diarrhœa; malt liquors are made from this infusion (wort) by adding hops and fermenting.

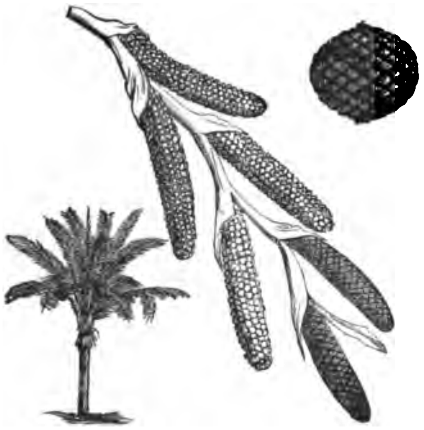
3. *Andropo'gon squarro'sa (murica'tus), Vetiveria (Vetivert).*—E. India. The fibrous wiry roots from the rhizome; yellowish-brown,

waxy, 15–20 Cm. (6–8′) long, 1 Mm. ($\frac{1}{25}$′) thick, tough, aromatic, balsamic. Contains volatile oil, resin. Used as tonic, stimulant, in perfumery, sachet powders, etc.

4. *So′rghum vulga′re, Broom Corn.*—Fruit 4 Mm. ($\frac{1}{6}$′) long, oval, flattened, brownish-yellow. Used in decoction (10 p. c.), for cystitis, etc.

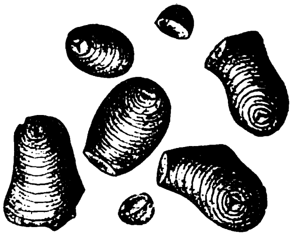
5. *Metro′xylon Ru′mphii* (*Sa′gus Ru′mphii*), *Pearl Sago.*—Palmaceæ. The prepared fecula official, 1820–1880. E. India Islands, Borneo, Moluccas, etc. Small palm, 6–9 M. (20–30°) high, stem thick, covered with leaf stalk remains, many pinnate leaves at apex; fruit round nut, covered with an imbricate coat, 1-seeded. The stem centre contains medullary matter like elder pith, which is obtained by felling and splitting the tree trunk, washing pith to extract the starch, which may be powdered, forming sago meal, or granulated. Each tree yields 500–600 lbs. (225–270 Kg.) of sago. Pearl sago is the best, in pearl-like grains, brownish, diaphanous, unaltered granules oblong, truncate, muller-shaped, layers distinct, hilum at rounded end often cleft; common sago (*M. Sa′gu*) is larger grained. Used as demulcent, nutrient for sick with weak digestion, fevers; it is easily digested, non-irritating, prepared by boiling 1 part in water 32, straining, flavoring. Factitious sago is made from potato starch.

FIG. 30.



Metroxylon Rumphii.

FIG. 31.



Sago starch.

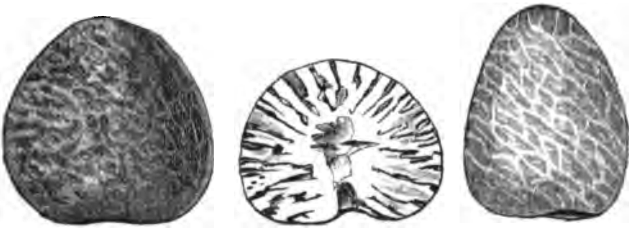
6. *Dæmo′norops* (*Ca′lamus*) *Dra′co, Draconis Resina* (*Dragon's Blood*).—Borneo, Sumatra. A spontaneous resinous exudation from the ripening fruit; occurs in tears, globular pieces 4 Cm. (1½′) thick, cylindrical sticks .3 M. (12′) long, or in irregular cakes, dark-brown, inside bright-red, fracture dull, irregular, inodorous; when heated aromatic like benzoin, tasteless; contains red resin, benzoic acid or cinnamic acid, or both wanting; mild stimulant, astringent. Used in tooth powders, plasters, varnishes.

7. *Are′ca Ca′techu, Areca Nut.*—E. Indies. Cultivated. Large palm tree 15–18 M. (50–60°) high, fruit orange-colored, size of hen's egg, contains one seed (nut), roundish, conical, 25 Mm. (1′) long, 9 Mm. ($\frac{3}{8}$′) thick, brown, with many reddish veins, inside horny,

white, odor faint, taste astringent, contains fat 14 p. c., tannin, resin, arecoline, $C_8H_{13}NO_2$ (poisonous, tænifuge), arecaine, guvacine; astringent, tænifuge. Dose, ʒij–3 (8–12 Gm.).

8. *Elæ'is guinee'nsis, Oleum Palmæ* (*Palm Oil*).—W. Africa. Heat fruit with water and express. It is a solid fat, harder than butter, orange-red, bleached by light and heat, violet odor, bland taste, demulcent. Used in ointments, but mostly in soaps and candles.

FIG. 32.



Areca Catechu.

9. *Co'cos nuci'fera, Oleum Cocois* (*Cocoanut Oil*).—Tropics. A fixed oil expressed from palm seeds after being boiled with water; yield 50–60 p. c. A white solid, consistence of butter, odor disagreeable, soon becoming rancid. Demulcent. Mostly used in soaps.

8. ARACEÆ. Arum Family.

A-ra'se-e. L. *Ar-um* or *aron* + aceæ, Gr. ἄρον, the wake robin, Egyptian word. Herbs or shrubs. Distinguished by acrid, pungent juice, poisonous, having tubers, corms, or rhizomes; leaves often veiny, petioled; flowers perfect or diœcious, spadix within spathe, no perianth; fruit succulent, terra or marsh plants; tropics, temperate climates; aromatic, stimulant, expectorant, antispasmodic, diaphoretic, starch, food.

Genus: 1. **Acorus.**

CALAMUS. CALAMUS (SWEET FLAG).

Acorus Calamus, *Linné.* } The rhizome.

Habitat. N. America, Europe, W. Asia, swampy places, along ditches, streams, ponds. Cultivated in Burmah, Ceylon.

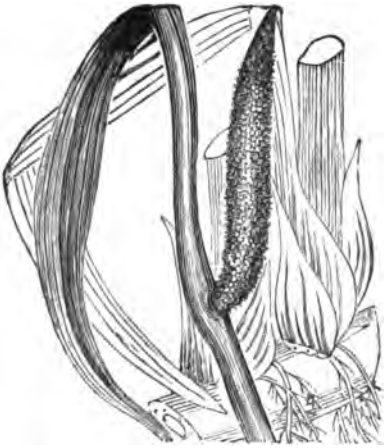
Syn. Sweet or Grass Myrtle, Myrtle Flag, Sweet Cane, Sweet Grass, Sweet Root, Sweet Rush, Sweet Sedge, Sea Sedge, Radix Calami Aromatici, Radix Acori, Calamus Root. Fr. Acore vrai, Acore odorant. Ger. Rhizoma Calami, Kalmuswurzel.

Ac'o-rus. L. fr. Gr. *a*, priv. + κόρη, the pupil of the eye; *i. e.*, originally thought to cure eye troubles.

Cal'a-mus. L. Gr. κάλαμος, a reed, cane (L. *culmus*), fr. Ar. *kalam*, a reed; *i. e.*, its leaves or scapes are cane or reed-like.

PLANT.—Perennial herb; leaves resembling those of the blue flag, *Iris versicolor*, 1–1.3 M. (3–4°) long, 2.5 Cm. (1') wide, sword-like, equitant; flowers May–June, in spike 5–10 Cm. (2–4') long. RHIZOME, .6–1 M. (2–3°) long, 18 Mm. (¾') thick, horizontal, unpeeled, subcylindrical, longitudinally wrinkled; upper surface with triangular leaf-scars, lower surface with circular scars of roots and rootlets in wavy lines, externally reddish-brown, internally whitish, spongy, fracture short, corky, showing many oil-cells and scattered wood-bundles; odor aromatic; taste aromatic, bitter. *Solvents:* alcohol; hot water partially. Dose, gr. 15–60 (1–4 Gm.).

FIG. 33.



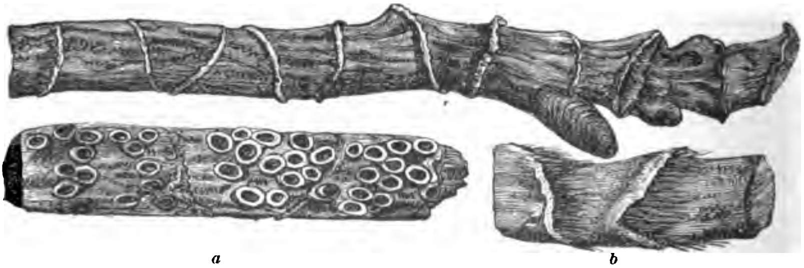
Acorus Calamus.

Commercial.—The rhizome is taken from the mucky earth by grubbing and pulling; it is then washed, freed from roots and dried with moderate heat, by which it shrinks one-half its diameter, but the odor and taste thereby become improved. In Germany rhizomes are often peeled before drying, thus giving a weaker product, owing to the fact that most of the volatile oil receptacles are in the cortex. Germany, Russia, England, United States and India furnish the markets, that coming from the latter having the claim of being stronger and more aromatic. It should be collected in autumn or spring, and by age deteriorates, often becoming attacked by worms.

CONSTITUENTS.—Volatile oil 1–2 p. c., Acorin 0.2 p. c., Acoretin (choline), Calamine, resin, tannin, starch, mucilage.

Volatile Oil.—Obtained by distillation, has brownish-yellow color, aromatic odor, sp. gr. 0.965, contains pinene, $C_{10}H_{16}$, and a sesquiterpene, a body having composition $C_{10}H_{16}O$, a high boiling fraction of a bluish color, and a small quantity of a phenol.

FIG. 34.



Acorus Calamus rhizome; *a*, under surface; *b*, upper surface.

Acorin, $C_{36}H_{60}O_6$, glucoside, yellowish-brown, honey-like liquid. Obtained from a concentrated decoction by precipitating it successively with alcohol, lead acetate and subacetate, removing lead by hydrogen sulphide, neutralizing with soda and agitating with ether. It is very bitter, aromatic, soluble in alcohol, chloroform, ether, precipitated from hydrochloric acid solution by tannin, and splits into the volatile oil and sugar.

Acoretin.—Obtained by the oxidation of acorin; it is a resin-like body which by reduction with alkali yields ethereal oil and sugar.

Calamine.—Alkaloid obtained from the extract after acorin is removed; it is crystalline, soluble in alcohol, chloroform, acetone.

PREPARATIONS.—1. *Extractum Calami Fluidum.* Fluid Extract of Calamus. (Syn., Fr. Extrait liquide d'Acore vrai; Ger. Flüssiges Kalmuswurzel-Extrakt.)

Manufacture: Macerate, percolate, 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Tincture, 20 p. c. (alcohol). Dose, ʒj–2 (4–8 Cc.). *Extract* (alcohol 40 p. c.). Dose, gr. 2–8 (.13–.5 Gm.). *Infusion.* Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Stimulant, carminative, tonic, bitter, aromatic.

USES.—Dyspepsia, colic, flatulency, typhoid condition, coughs, flavoring. In India also used as an insectifuge, for fleas, etc. The Turks use the candied rhizomes as a preventive against contagion.

The *Κάλαμος αρωματικός* of Dioscorides was a different plant from this, being possibly one of the *Andropo'gons.*

Allied Plants:

1. *Arisæ'ma (A'rum) triphy'llum, Indian Turnip.*—The cormus official, 1820–1870. N. America. Plant acaulescent, leaves two, 3-divided, 5–17.5 Cm. (2–7′) long, 2.5–7.5 Cm. (1–3′) wide. Corm 2.5–5 Cm. (1–2′) broad, brownish-gray, inside white, mealy, taste burning, acrid, contains volatile acrid principle, starch, fat, mucilage, calcium oxalate (gives acridity). Used as stimulant, expectorant, diaphoretic, irritant for colic, flatulence, asthma, whooping-cough, chronic catarrh, rheumatism, bronchitis, aphthous sores, ringworm; in honey, syrup, ointment. Dose, gr. 5–15 (.3–1 Gm.).

2. *Spathye'ma (Symploca'rpus) fœ'tida, Skunk Cabbage.*—The root (rhizome) official, 1820–1880. Perennial, spathe appears first in spring, covered with purplish spots and stripes, flowers dull-purple, leaves .3–.6 M. (1–2°) long, .3–.4 M. (12–15′) wide. Rhizome obconical, truncate, 7.5–10 Cm. (3–4′) long, 5 Cm. (2′) thick. Many rootlets, brownish-gray, inside whitish, many wood-bundles, whole plant fetid, more so when triturated, taste acrid, biting, contains fat, resin, starch. Emetic, diuretic, antispasmodic, stimulant, narcotic; for asthma, chronic catarrh, rheumatism, chorea, hysteria, dropsy, bronchitis, in infusion, tincture. Dose, gr. 5–15 (.3–1 Gm.).

3. *Epipre'mnum mira'bile (Rhaphido'phora vitie'nsis,*—Araceæ), and *Pre'mna traite'nsis, Tonga.*—Verbenaceæ. Fiji Islands. The mixed bark contains tongine (volatile alkaloid), volatile oil. Anodyne; neuralgia, rheumatism, in combination with salicylates. Dose, gr. 15–60 (1–4 Gm.).

9. MELANTHACEÆ. Bunch-flower Family.

Me-lan-tha′se-e. L. *Melanth-ium* + aceæ, fr. Gr. *μέλας*, black, + *ἄνθος*, flower, *i. e.*, alluding to the darker color which the persistent perianth assumes after blossoming. Leafy-stemmed herbs. Distinguished by being rarely bulbous; leaves grass-like, parallel-veined with transverse veinlets; perianth 6, stamens 6, ovary 3-celled, superior; fruit capsule, septicidal; seeds tailed or appendaged; temperate climates; sedative, diaphoretic, sternutatory, poisonous.

Genera: 1. **Veratrum.** 2. **Asagræa.**

VERATRUM VIRIDE. VERATRUM VIRIDE (AMERICAN HELLEBORE).

Veratrum viride, *Aiton.* } The rhizome and roots.

Habitat. N. America (Canada to Georgia), in rich, wet woods, swamps.

Syn. American White Hellebore, Green-, Swamp-, or False Veratrum or Hellebore, Devil's Bite, Duckretter, Poke Root, Indian Poke, Earth Gall, Tickle or Itch Weed, Bugbane. Br. Veratri Viridis Rhizoma. Fr. Vératre vert. Ger. Grüner Germer.

Ve-ra′trum. L. *vere*, truly, + *ater*, black, dark; *i. e.*, the color of the roots of some species.

Vir′i-de. L. *viridis*, green; *i. e.*, flowers are greenish.

PLANT.—Large perennial herb; stem annual, .6–2 M. (2–7°) high, stout, cylindrical, solid, nearly smooth, pale-green, unbranched except in the inflorescence; leaves 12.5–20 Cm. (5–8′) long, oblong, acuminate, sheathing the stem, plaited, nerved, pubescent; flowers May–July, many polygamous, nearly sessile, greenish-yellow, racemes with downy peduncles, sepals petaloid; fruit of 3 nearly distinct follicles 2.5 Cm. (1′) long, pericarp dry, brown, ventral dehiscence; seed flat, about 12 in each carpel. RHIZOME, upright, obconical, simple or divided, 2.5–7.5 Cm. (1–3′) long, 2–5 Cm. ($\frac{4}{5}$–2′) thick, tufted above, truncate below, blackish-gray; internally grayish-white, showing many short, irregular wood-bundles; roots from all sides of rhizome, numerous, shrivelled, yellowish-brown, 12.5–25 Cm. (5–10′) long, 2 Mm. ($\frac{1}{12}$′) thick; inodorous, powder strongly sternutatory; taste bitter, acrid. *Solvent:* alcohol. Dose, gr. 1–4 (.06–.26 Gm.).

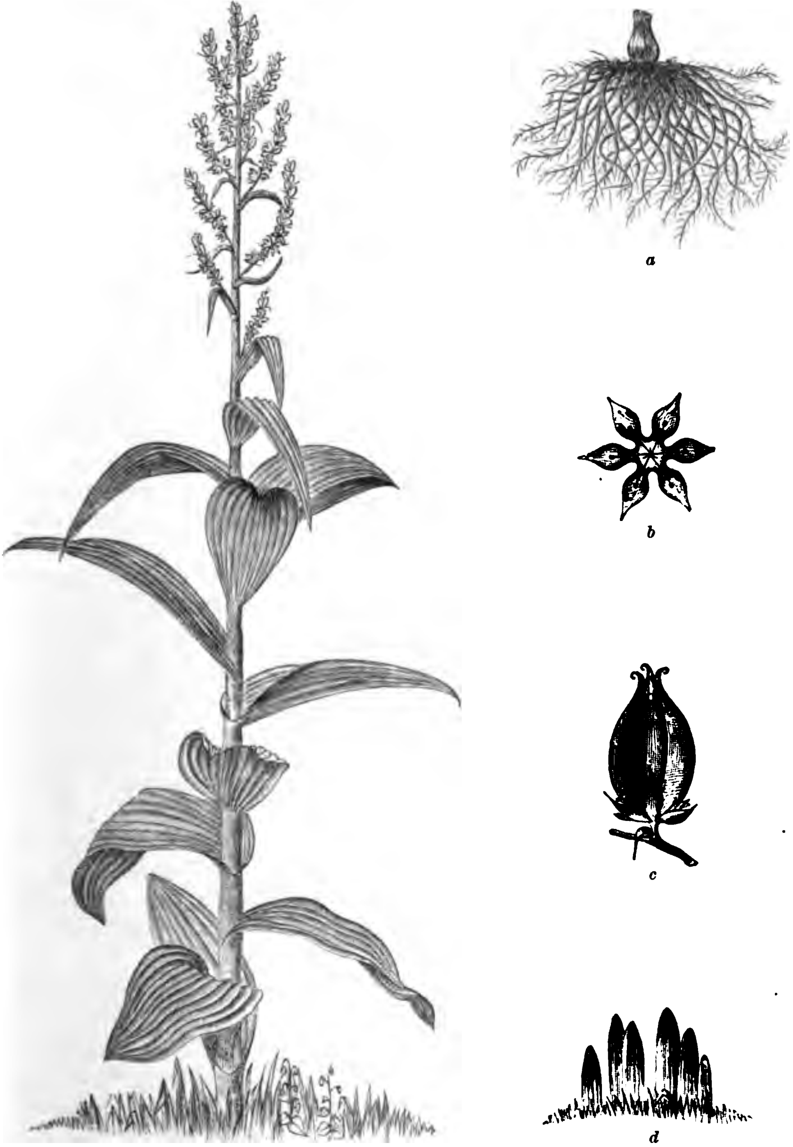
ADULTERATIONS.—With rhizomes of allied plants also with those of *Spathye′ma* (*Symploca′rpus*) *fœtida.*

Commercial.—This plant is possibly identical with European *Veratrum album*, but is taller, has narrower leaves and greener flowers. The rhizome is mainly collected in autumn or sometimes just before flowering, and owing to deteriorating should not be kept more than a year. After being dug, it is washed and either dried whole or variously sliced.

CONSTITUENTS.—Jervine, Veratroidine, Pseudojervine, Rubijervine, Cavadine, resin, starch.

Jervine, $C_{26}H_{37}NO_3$, crystalline, tasteless, non-sternutatory, but depressant, soluble in alcohol, chloroform. With strong hydrochloric acid turns gradually red, becoming yellow by boiling ; with sulphuric acid becomes yellow, changing to green, finally turbid-yellow.

FIG. 35.



Veratrum viride ; *a*, root ; *b*, flower ; *c*, ovary; *d*, plant at its early age.

Veratroidine, $C_{32}H_{53}NO_9$, resembles veratrine, non-crystalline, consisting possibly of rubijervine + toxic resin ; it is sternutatory and emeto-cathartic, soluble in ether, chloroform, benzene. With sulphuric acid turns yellow, then red; with hydrochloric acid pale-red, becoming cherry-red by boiling.

Pseudojervine, $C_{29}H_{43}NO_7$, resembles jervine, but the sulphate of the former is more soluble in water.

Rubijervine, $C_{26}H_{43}NO_2$, resembles veratroidine, but is non-sternutatory.

Cevadine, $C_{32}H_{49}NO_9$, is sternutatory, present also in sabadilla seed.

PREPARATIONS.—1. *Extractum Veratri Viridis Fluidum.* Fluid Extract of Veratrum Viride. (Syn., Fr. Extrait liquide de Vératre Américain; Ger. Flüssiges Grüngermerwurz Extract.)

Manufacture: Macerate, percolate, 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏j–4 (.06–.26 Gm.).

2. *Tinctura Veratri Viridis.* Tincture of Veratrum Viride. (Syn., Tincture of Green (American) Hellebore; Fr. Teinture de Vératre vert; Ger. Grün Nieswurz-tinktur.)

Manufacture: 40 p. c. Macerate, percolate 40 Gm. with alcohol q. s. 100 Cc. Dose, ♏ij–10 (.13–.6 Cc.).

Unoff. Preps.: Extract. Dose, gr. $\frac{1}{8}$–$\frac{1}{4}$ (.008–.016 Gm.). *Dr. Norwood's Tincture,* 50 p. c., saturated, being the same strength as the official tincture of 1870. Dose, ♏v–8 (.3–.5 Cc.).

PROPERTIES.—Sedative, emetic, diaphoretic, irritant, sternutatory, errhine. This resembles aconite very closely in action, being a cardiac depressant and spinal paralyzant. It diminishes the frequency and force of cardiac contractions, by depressing heart muscle, and stimulating inhibition (pneumogastric), depresses spinal cord, causing muscular relaxation, induces cutaneous relaxation hence free sweating; large doses produce rapid but very feeble pulse, cold clammy skin, vomiting, debility, giddiness, impaired vision, partial unconsciousness; it is eliminated by the bowels. Jervine is the depressant, causes salivation, kills by asphyxia, the heart beating after respiration ceases. Veratroidine depresses the cord, paralyzes respiration, and causes emeto-catharsis, thereby often preventing fatal results.

USES.—To reduce arterial excitement, spinal spasms, pneumonia, cardiac diseases, typhoid fever. Always given in the commencing or inflammatory stages, heart disease, nervous palpitation, puerperal and epileptiform convulsions, tetanus, chorea, mania-a-potu, diphtheria.

Poisoning, Incompatibles, Synergists; same as for aconite.

Allied Plants:

I. *V. album, White Hellebore.*—The rhizome official, 1820–1880, Europe—Alps, Pyrenees, Balkans. Plant nearly identical with official, variations being due possibly to climatic and soil differences. Contains jervine, pseudojervine, rubijervine, veratralbine (amorphous, resembles veratrine), protoveratrine, protoveratridine, jervic acid (chelidonic acid), resin, sugar, veratramarin. Properties and uses same as official.

SABADILLA. CEVADILLA.

Veratrina. Veratrine, *official.*

Asagræa officinalis, *Schlechtendal et Chamisso.* } A mixture of alkaloids obtained from the seed.

Habitat. Mexico to Guatemala and Venezuela.

Syn. Indian Barley-caustic. Fr. Cévadille. Ger. Sabadillsamen, Läusekörner.

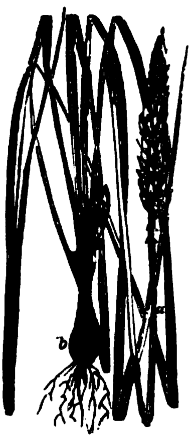
A-sa-græ′a. L. after Asa Gray, formerly professor of botany, Harvard University.

Of-fi-ci-na′lis. L. *officina*, a workshop, = *opus*, work, + *facere*, to do, to make; *i. e.*, used in or belonging to the shop or store.

Sab-a-dil′la. L. fr. Sp. *cevadilla*, *cebadilla*, fr. *cibare*, to feed, *cibus*, food.

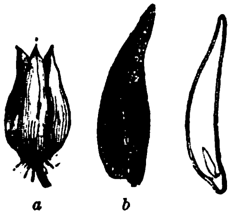
Plant.—This is a bulbous herb, bulb ovoid, covered with numerous black scales; scape 1.2–1.5 M. (4–5°) high; leaves from bulb, linear, grass-like, .3–1.3 M. (1–4°) long, smooth, entire, strong midrib; flowers numerous, 12 Mm. (½′) wide, monœcious, lower ones hermaphrodite; upper staminate, greenish-yellow, racemes, 22.5–45 Cm. (9–18′) long; fruit composed of 3 dry follicles 12 Mm. (½′) long, pericarp pale-brown, papery, dehiscent. Seeds 2–5 in each follicle, dark-brown, fusiform, compressed, 6 Mm. (¼′) long, slightly winged above, angular, testa thin, rugosely wrinkled, albumin whitish, oily, inodorous, bitter, acrid, sternutatory. Dose, gr. 1–4 (.06–.26 Gm.).

Fig. 36.



Asagræa officinalis; *a*, fruit-bearing stem; *b*, root, bulb and leaves.

Fig. 37.



Sabadilla; *a*, fruit natural size; *b*, seed and longitudinal section magnified.

Commercial.—Sabadilla seeds are not now supposed, as formerly, to come from *Vera′trum Sabadil′la*, but mostly from *Asagræa officinalis* (*Schœnocau′lon officina′le*, *Vera′trum officina′le*, *Helo′nias officina′lis*). They at one time came solely from Vera Cruz, being derived from cultivated Mexican plants, but are now chiefly shipped from La Guayra, the port of Caraças and Venezuela: the ripe capsules from Mexico.

Constituents.—Veratrine, cevadine, $C_{32}H_{49}NO_9$, cevadilline, $C_{34}H_{53}NO_8$, sabadine, $C_{29}H_{51}NO_8$, sabadinine, $C_{27}H_{43}NO_8$, angelic acid, $C_5H_8O_2$, methyl-crotonic acid, $C_5H_8O_2$, cevadic acid, veratric acid, fixed oil, ash 3.5 p. c.

Veratrina. Veratrine, $C_{37}H_{53}NO_{11}$.—Obtained by exhausting seed with alcohol, evaporating to syrup, adding water to get rid of resin, oil, etc.; the filtrate, containing veratrine veratrate, is precipitated with ammonia in excess. Another method is to boil alcoholic extract in acidulated water (HCl or H_2SO_4), decompose with magnesia, take up alkaloids with acidified alcohol, evaporate, filter through charcoal, precipitate with ammonia. Commercial or medicinal veratrine usually consists of veratrine, cevadine (most important, sternutatory, with potassa splitting into methyl-crotonic acid and amorphous cevine, $C_{27}H_{43}NO_8$), cevadilline (amorphous, insoluble in ether, benzene), sabadine (non-sternutatory, crystallizes from ether in needles and, like the preceding alkaloids, is colored yellow, then red by sulphuric acid), sabadinine (resembles sabadine, but turns red at once with sulphuric acid), and their derivatives. Occurs in whitish, amorphous, or semi-crystalline powder, odorless, causes sneezing, acrid with tingling, numbness to the tongue; soluble in alcohol (3 parts), chloroform (2), ether (6), no residue. *Tests:* 1. With nitric acid gives yellow; with sulphuric acid the orange-red solution gives by reflected light greenish fluorescence, intensified by additional acid; with potassa deep-red by transmitted light. 2. Heated with hydrochloric acid the liquid acquires a deep-red color; with potassa splits into veratric acid and amorphous verine, $C_{28}H_{45}NO_8$. Dose, gr. $\frac{1}{32}$–$\frac{1}{12}$ (.002–.005 Gm.).

PREPARATIONS.—1. *Oleatum Veratrinæ.* Oleate of Veratrine. (Syn., Veratrinum Oleïcum; Fr. Oléate de Vératrine; Ger. Oelsaures Veratrin.)

Manufacture: 2 p. c. Veratrine 2 Gm. dissolved in warm oleic acid 98. Used externally.

2. *Unguentum Veratrinæ.* Veratrine Ointment. (Syn., Fr. Pommade de Vératrine; Ger. Veratrinsalbe.)

Manufacture: 4 p. c. Veratrine 4 Gm., olive oil 6, benzoinated lard 90. Used externally.

PROPERTIES.—Sedative, powerful irritant, sternutatory, errhine. Locally gives heat, pain, redness, numbness. Internally causes burning sensation, free salivation, great depression, reduces force and rate of pulse; large doses make contractions few, each lasting a long time, until heart stops in systole. When poisoned have muscular weakness, nausea, vomiting, purging, debility, giddiness, impaired vision, partial unconsciousness, violent convulsions, muscular paralysis, seldom kills, if so, from heart paralysis.

USES.—Chiefly externally, neuralgia, headache, sciatica, pruritus, pediculi, acute articular rheumatism, pneumonia, epilepsy, chronic swellings, stiff, indurated sprains. For these can apply it in fat or alcohol (1–5 p. c.) using gr. 2–4 (.13–.26 Gm.) per day, but never on abraded surface. Internally for heart trouble, cardiac dropsies, gout, rheumatism, fevers, inflammations, dysmenorrhœa. Owing to its dangerous depressing and uncertain action it is little used, as aconitine can well be substituted for it.

Poisoning, Incompatibles, Synergists: same as for aconite.

10. LILIACEÆ. Lily Family.

Lil-i-a'se-e. L. *Lili-um* + aceæ, a lily, fr. Celtic *li*, whiteness, alluding to beautiful white flowers of original species. Herbs, shrubs, or trees. Distinguished by having bulbs, rhizomes, tubers or fibrous roots; leaves parallel-veined (except in Smilaceæ); flowers regular symmetrical, 6-androus, perianth non-glumaceous, petaloid, free from 3-celled, superior ovary; anthers 2-celled; fruit many- or few-seeded pod or berry; temperate climates, tropics; purgative, emetic, diuretic, diaphoretic, stimulant, astringent, acrid, fibres, food, condiment.

Genera: 1. **Allium.** 2. **Urginea.** 3. **Aloe.**

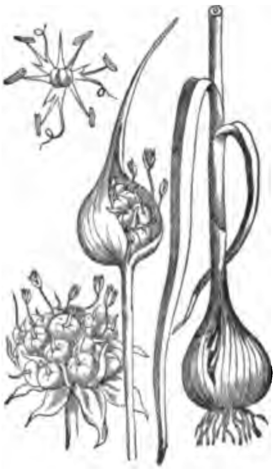
ALLIUM. GARLIC.

Allium sativum, *Linné.* } The bulb, used without drying.

Habitat. C. Asia, S. Europe (Sicily, Italy, S. France) cultivated, N. America, etc.
Syn. English or Clove Garlic, Bulbus Allii. Fr. Ail. Ger. Knoblauch.
Al'li-um. L. for garlic, fr. Celtic *all*, hot; *i. e.*, from its characteristic hot taste.
Sa-ti'vum. L. cultivated; *i. e.*, the kind used as contradistinguishing the wild-grown.

PLANT.—Bulbous, .6 M. (2°) high; leaves long, flat, grass-like; flowers July, small, white, at the termination of the stem enclosed in pointed spathe, umbels. BULB, commonly called *cloves of garlic*; subglobular, compounded of eight-wedged bulblets in a circle, covered by several membranous scales; odor pungent, alliaceous; taste warm, acrid. *Solvents:* water; alcohol; diluted acetic acid, vinegar. Dose, ʒss–1 (2–4 Gm.).

FIG. 38.



Allium sativum.

CONSTITUENTS.—Volatile oil ¼ p. c., mucilage 35 p. c., albumin, sugar, water 60 p. c.

Volatile Oil.—Obtained by distillation from the bulb and herb, being when purified a yellowish liquid, to which odor, taste, and medical properties are due; sp. gr. 1.053. Contains the compound $C_6H_{12}S_2$ = allyl-propyldisulphide $\left(\begin{smallmatrix} C_3H_5S \\ C_3H_7S \end{smallmatrix}\right)$, and $C_6H_{10}S_2$ = diallyldisulphide $\left(\begin{smallmatrix} C_3H_5S \\ C_3H_5S \end{smallmatrix}\right)$, the higher boiling portions containing bodies of the composition $C_6H_{10}S_3$, and $C_6H_{10}S_4$. Dose, ♏j–5 (.06–.3 Cc.).

PREPARATIONS.—1. *Syrupus Allii.* Syrup of Garlic. (Syn., Fr. Sirop d'Ail; Ger. Knoblauchsirup.)

Manufacture: 20 p. c. Macerate fresh garlic 20 Gm. for four days in diluted acetic acid 50 Cc., express, filter; in filtrate dissolve sugar 80 Gm., add diluted acetic acid q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

Unoff. Preps.: Fresh Juice. Dose, ʒss (2 Cc.). *Liniment. Poultice.*

Properties.—Stimulant, diuretic, expectorant, anthelmintic, rubefacient, condiment; excites circulation, nervous system, expectoration.

Uses.—Bronchitis, indigestion, infantile catarrh, nervous coughs and vomiting. Locally poultice, to lungs for catarrhal pneumonia, to feet for nervous restlessness, and convulsions in children. May also be applied to abscesses, earache, insect and serpent wounds.

Allied Plants:

1. *A. Ce′pa*, *Onion*, and *A. Po′rrum*, *Leek*. Both used similarly.

SCILLA. SQUILL.

Urginea maritima, (*Linné*) *Baker*. } The bulb deprived of its dry, membranaceous outer scales and cut into thin slices, the central portions being rejected.

Habitat. Mediterranean Basin, near the sea. Spain, France, Italy, Greece, Portugal, Morocco, Algeria; in sandy, also hilly localities.

Syn. Sea Onion, White or Red Squills. Fr. Squille, Scille. Ger. Bulbus Scillæ, Meerzwiebel.

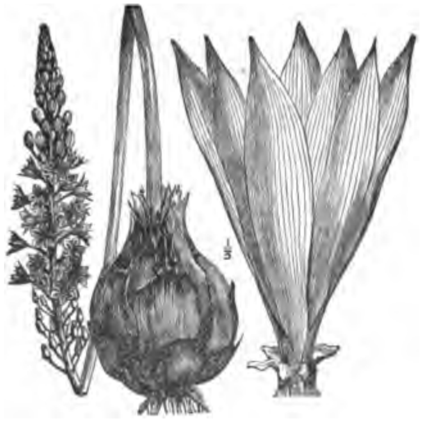
Ur-gin′e-a. L. *urgere*, to press, urge; *i. e.*, its flattened, compressed seeds, or fr. Algerian Arab tribe *Ben urgin*.

Ma-rit′i-ma. L. *maritimus*, of the sea, maritime; *i. e.*, its habitat near the sea.

Scil′la. L. fr. Gr. *σκίζειν*, to split; *i. e.*, splits into scales; *σκίλλα*, an onion.

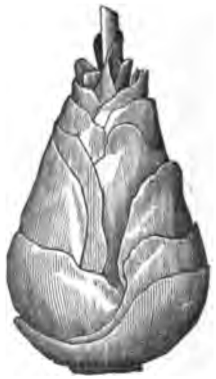
Plant.—Perennial herb; roots fibrous from base of large bulb; leaves appear long after flowers, several, .5–.6 M. (1½–2°) long, shining, deep-green; flowers white, on succulent stem, .3–1 M. (1–3°) high, in close spike, no calyx, peduncles purplish; fruit, dry capsule 12 Mm. (½′) long, oblong, 3-lobed, yellow, seeds 6 in each cell, 6 Mm. (¼′) long, flattened, purplish-brown. Bulb, pear-shaped when fresh, size of fist to child's head, 7.5–15 Cm. (3–6′) long and broad, often weighing 4 lbs. (1.8 Kg.). Consists of fleshy scales, with attenuated edges closely applied over one another; in shops as narrow segments, 5 Cm. (2′)

Fig. 39.



Urginea maritima.

Fig. 40.



Scilla bulb, prepared for slicing.

long, slightly translucent, yellowish-white or reddish, brittle, and when dry pulverizable, tough, flexible after exposure to dampness; inodorous; taste mucilaginous, bitter, acrid. *Solvents:* alcohol (75 p. c.); diluted acetic acid; vinegar, water. Dose, gr. 1–5 (.06–.3 Gm.) ter die until nauseated; gr. 5–10 (.3–.6 Gm.) will usually vomit.

Commercial.—Bulb flourishes in dry, sandy places on seacoast, being only half immersed in the soil; flowers in autumn, but leaves appear in following spring. Was early known as a valuable medicine, but first cultivated in Europe 1630. There are two varieties—*white* and *red*, the former having white scales, the latter reddish-brown and rose color; both are the same medicinally, yet the white is preferred, as it makes less colored solutions. Bulbs are collected in August, deprived of dry outer scales, cut transversely into thin slices, dried by sun, packed in casks, and shipped from Malta; it abounds in viscid, acrid juice, which excoriates the skin when handled, but this quality is lost upon drying without changing medical properties; loses 80 p. c. on drying, reabsorbs 11 p. c. moisture on exposure, becoming mouldy, hence should be kept dry in well-stoppered bottles.

CONSTITUENTS.—Scillitin (scillipicrin, scillitoxin, scillin), Sinistrin, sugar, calcium oxalate 3–8 p. c., ash 3 p. c.

Scillitin.—Bitter principle, upon which activity depends, but it has never been obtained pure. Dose, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.01–.03 Gm.). Instead of this, Merck gives three active principles:

(1) **Scillipicrin.**—Bitter principle, yellowish-white, amorphous, soluble in water, hygroscopic, acts upon the kidneys. Dose, gr. $\frac{1}{3}$–1 (.02–.06 Gm.).

(2) **Scillitoxin (Scillain).**—Glucoside, brown, bitter, burning taste, soluble in alcohol, acts upon heart. Dose, gr. $\frac{1}{60}$–$\frac{1}{30}$ (.001–.002 Gm.).

(3) **Scillin.**—Crystalline, soluble in alcohol, hot ether, benumbs, vomits. Later investigators think these to be alkaloids, so their names have been changed: (1) Scillapicrine, soluble in water, alcohol; (2) Scillamarine, soluble in chloroform, alcohol; (3) Scillinine, soluble in alcohol, insoluble in water, chloroform.

Sinistrin, $C_6H_{10}O_5$, white mucilage, resembles dextrin, levogyrate, easily converted into sugar, by boiling with diluted sulphuric acid.

PREPARATIONS.—1. *Acetum Scillæ.* Vinegar of Squill. (Syn., Fr. Vinaigre (Acétolé) Scillitique; Ger. Meerzwiebel Essig.)

Manufacture: 10 p. c. Macerate 10 Gm. with diluted acetic acid q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Prep.: 1. *Syrupus Scillæ.* Syrup of Squill. (Syn., Syrupus Aceti Scillæ; Fr. Sirop de Scille; Ger. Meerzwiebelsirup.)

Manufacture: Vinegar of squill 45 Cc., sugar 80 Gm.; water q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

2. *Extractum Scillæ Fluidum.* Fluid Extract of Squill. (Syn., Fr. Extrait liquide de Scille; Ger. Flüssiges Meerzwiebel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏j–5 (.06–.3 Cc.).

Prep.: 1. *Syrupus Scillæ Compositus.* Compound Syrup of Squill. (Syn., Hive Syrup, Croup Syrup; Fr. Sirop de Scille Composé; Ger. Zusammengesetzter Meerzwiebel-sirup.)

Manufacture: Fluid extract of squill 8 Cc., fluid extract of senega 8, tartar emetic .2 Gm., precipitated calcium phosphate 1, sugar 75, water q. s. 100 Cc. Dose, ♏v–60 (.3–4 Cc.).

Cox's Hive Syrup differs from this only in using honey instead of sugar as the preservative.

3. *Tinctura Scillæ.* Tincture of Squill. (Syn., Fr. Teinture de Scille; Ger. Meerzwiebeltinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Unoff. Preps.: Acetic Extract. Dose, gr. ⅙–2 (.01–.13 Gm.). *Pilula.*

Properties.—Resembles digitalis; expectorant, diuretic, emetic, cardiac stimulant, cathartic, irritant. Large doses irritant poison, causing gastro-enteritis, strangury, bloody urine, convulsions, death by heart paralysis.

Uses.—Expectorant in croup, irritant coughs, whooping-cough, bronchitis, asthma, associated with ipecac, ammonia, asafetida, benzoin, etc. Owing to its irritating properties should not be given in acute stage. Diuretic in dropsies from cardiac disease when it should be combined with digitalis or saline diuretics. Give to children with croup until nausea and vomiting occur. The Greeks, Romans, and Arabians used it in dropsies, ulcerated gums and throat, weak digestion.

Fresh juice applied to abrasions is diuretic; to healthy skin rubefacient, which may be due to calcium oxalate needle-shaped crystals or to contained acrid resinoid, here also ultimately get the diuretic effect.

Poisoning: Evacuate stomach, give tannin, demulcents, opiates, stimulants.

ALOE SOCOTRINA. SOCOTRINE ALOES.

Aloe Perryi, *Baker.* } The inspissated juice of the leaves.

Habitat. E. Africa, Island of Socotra; cultivated.

Syn. Bombay-, Mocha-, Turkey- or Zanzibar-Aloes. Fr. Aloès (Socotrin) Sucotrin. Ger. Socotora Aloe, Socotrinische Aloe.

Al′o-e. L. fr. Ar. *Alloeh*, Gr. ἀλόη, native names for the aloe.

Per′ry-i. L. after Wykeham Perry, who studied the plant natively.

Soc-o-tri′na. L. for Socotra, corrupt. of *Socotorina* or *Socotrina*, an island east of Africa, its chief habitat. It may come from *succus citrinus—succotrin(um)-a; i. e.*, the lemon-yellow color of its powder in the axis of a pinkish bract.

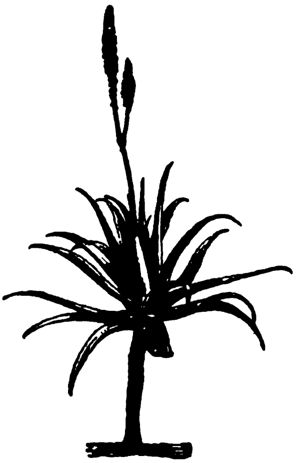
Plant.—All species of aloes resemble to some extent *Aga′ve americana*, American Aloe or century plant; stem 1.5 M. (5°) high, woody, very rough from remnants of previous leaves; leaves glaucous-green, thick, succulent, sword-shaped, with many white serratures on the margin; flowers orange-red, paler in centre, apex greenish, stamens 6, unequal, 3 longer than corolla, racemes.

INSPISSATED JUICE (aloes), in masses, with interior sometimes soft, orange or ruby-brown, powder bright, golden-yellow, fracture smooth or ragged, not conchoidal, crystalline; odor pleasant, saffron-like when breathed upon; taste intensely bitter, slightly aromatic. *Tests:* 1. With nitric acid get reddish-brown color. 2. With sulphuric acid + nitric acid vapor have no change unless Natal aloes present, when get deep-blue. *Solvents:* alcohol, boiling water or 4 parts cold water; not affected by chloroform or ether. Dose, gr. ½–10 (.03–.6 Gm.).

ADULTERATIONS.—Chiefly with dried juice of inferior allied species, also small quantities of leaves, wood, sticks, stones, leather, monkey and goat skins, implements (knives, etc.), iron, resin, pitch, ochre, burned-bones, gum, liquorice, etc.; 5–27 p. c.

Commercial.—Aloe was known to Dioscorides and Celsus. The large, thick leaves contain in their centre an insipid, thick, mucilaginous juice, and near the surface in distinct, elongated thin-walled ducts a bitter yellowish juice, which varies in activity with age of leaf and season of year. Juice is collected by cutting off leaves near their base during sunshine in March–April; these are stood up for half an hour in skins, or a series of five V-shaped wooden troughs (1.2 M.; 4° long—.3–.5 M.; 12–18′ deep), each with an opening in the lower inclined end, to run off juice, as it exudes by gravity alone, into metal (iron or copper) vessels for evaporation; this latter is continued five hours, during which the impurities are ladled out. The juice, at first colorless, soon becomes yellowish-brown on exposure, and is sometimes kept in barrels for months, as it does not spoil, and then according to demand reduced slowly by sun, or rapidly by fire. When of proper consistence this evaporated product—commercial aloes—is poured into monkey skins, kegs, tin-lined boxes, etc., and marketed via Bombay and Zanzibar.

FIG. 41.



Aloe Perryi.

CONSTITUENTS.—Aloin (soc-aloin), Resin 30–50 p. c., volatile oil 0.0015 p. c., emodin, ash 1 p. c.

Aloinum. **Aloin,** *official.*—Neutral principle chiefly from Socotrine aloes (soc-aloin, $C_{15}H_{16}O_7$), and Barbadoes aloes (barb-aloin, $C_{17}H_{20}O_7$); sparingly from Natal aloes (nat-aloin, $C_{16}H_{18}O_7$), and other species, each product slightly differing. It is obtained by digesting Socotrine or Jafferabad aloes 1 part, in alcohol 3 parts, for twenty-four hours, boiling two hours, filtering, setting aside for crystallization—yield 10 p. c.; or by dissolving Barbadoes, Curaçao or Bonaire aloes 1 part in boiling acidulated (HCl) water 10 parts, when cold resin deposits; decant, evaporate to two parts, set aside two weeks to crystallize—yield

20–25 p. c.; hydrochloric acid added to alcoholic solution yields **aloe-emodin.**

Barb-aloin + nitric acid gives crimson color; is oxidized into one-third its weight (33 p. c.) of chrysammic acid (in golden-yellow laminæ) and smaller quantities of aloetic (orange-red powder), picric and oxalic acids.

Soc-aloin + nitric acid gives no color-change, otherwise same as barb-aloin.

Nat-aloin, least soluble in nitric acid, but gives crimson color, and oxidizes into only picric and oxalic acids; if add sulphuric acid get blue color, which is not the case with two preceding. Aloin is twice as active as aloes and produces usually no griping. Dose, gr. ½–2 (.03–.13 Gm.).

Resin.—Obtained by allowing a dilute aloetic infusion to cool, when it precipitates, filter, dry. Soluble in hot water (thus differing from other resins), alcohol, ether, alkaline solutions; brownish-black by ferric salts; by hydrolysis yields cinnamic acid and aloresino-tannol; equally active as the drug, which may be from accidental aloin present.

Emodin.—Obtained by dissolving it from aloin with ether; considered the purgative principle.

PREPARATIONS.—1. *Extractum Aloes.* Extract of Aloes. (Syn., Extractum Aloes Socotrinæ; Fr. Extrait d'Aloès; Ger. Aloe Extrakt.)

Manufacture: Aloes 10 Gm., boiling distilled water 100 Cc., let stand twelve hours, evaporate strained solution. Dose, gr. ½–5 (.03–.3 Gm.).

2. *Aloe Purificata.* Purified Aloes. (Syn., Fr. Aloès Dépuré; Ger. Gereinigte Aloe.)

Manufacture: Socotrine aloes 100 Gm., melt, add alcohol 20 Cc., evaporate strained solution. Alcohol keeps it fluid sufficiently long for it to pass through No. 60 sieve. Occurs in irregular brittle pieces, brownish-red, odor of Socotrine aloes, almost entirely soluble in alcohol. Should be kept in well-stoppered bottles. This process removes the impurities mentioned under adulterations. Dose, gr. ½–10 (.03–.6 Gm.).

Preps. 1. *Pilulæ Aloes.* Pills of Aloes. (Syn., Br. Pilula Aloes Socotrinæ; Fr. Pilules d'Aloès et de Savon; Ger. Aloe-pillen.)

Manufacture: Aloes 13 Gm., soap 13, water q. s. 100 pills. Dose, 1–4 pills.

2. *Pilulæ Aloes et Asafœtidæ.* Pills of Aloes and Asafetida. (Syn., Fr. Pilules d'Aloès et Ascfétide; Ger. Aloe und Asafœtida-Pillen.)

Manufacture: Aloes 9 Gm., asafetida 9, soap 9, water q. s. 100 pills. Dose, 1–5 pills.

3. *Pilulæ Aloes et Ferri.* Pills of Aloes and Iron. (Syn., Fr. Pilules d'Aloès et de Fer; Ger. Pilulæ Aloeticæ Ferratæ, Pilulæ Italicæ Nigræ, Aloe und Eisenpillen, Italienische-Pillen.)

Manufacture: Aloes, dried sulphate of iron, aromatic powder, each 7 Gm., confection of rose q. s. 100 pills. Dose, 1–4 pills.

4. *Pilulæ Aloes et Mastiches.* Pills of Aloes and Mastic. (Syn., Lady Webster's Dinner Pills; Fr. Pilules d'Aloès et de Mastic; Ger. Aloe und Mastix-Pillen.)

Manufacture: Aloes 13 Gm., mastic 4, red rose 3, water q. s. 100 pills. Dose, 1–3 pills.

5. *Pilulæ Aloes et Myrrhæ.* Pills of Aloes and Myrrh. (Syn., Rufus's Pills; Fr. Pilules d'Aloès et de Myrrhe, Pilules de Rufus; Ger. Rufus'sche Pillen.)

Manufacture: Aloes 13 Gm., myrrh 6, aromatic powder 4, syrup q. s. 100 pills. Dose, 1–6 pills.

6. *Tinctura Aloes.* Tincture of Aloes. (Syn., Fr. Teinture d'Aloès; Ger. Aloetinktur.)

Manufacture: 10 p. c. Macerate, percolate aloes 10 Gm., liquorice root 20, with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

7. *Tinctura Aloes et Myrrhæ.* Tincture of Aloes and Myrrh. (Syn., Tinctura Aloes Composita; Fr. Elixir de Propriété; Ger. Elixir Proprietatis Paracelsi, Aloëelixir.)

Manufacture: Macerate, percolate, aloes, myrrh, liquorice root each 10 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

8. *Extractum Colocynthidis Compositum,* 50 p. c. Dose, gr. 5–15 (.3–1 Gm.).

9. *Pilulæ Rhei Compositæ,* gr. 1½ (.1 Gm.) in each pill. Dose, 2–5 pills.

10. *Tinctura Benzoini Composita,* 2 p. c. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Pulvis Aloes et Canellæ. Hiera Picra—Aloes 80 + Canella 20. Dose, gr. 15–30 (1–2 Gm.). *Compound Decoction. Vinum.*

PROPERTIES.—Cathartic, drastic, emmenagogue, vermifuge, stomachic. The action is especially on the colon and lower half of the large intestine, and thus causes irritation to uterus and inflamed hemorrhoids; stimulates the functions of the liver, intestinal secretions generally, increases the flow of bile and acts in about 15 hours. Abnormal doses do not produce proportionately excessive results, but invariably cause tormina, tenesmus with heat and rectal irritation. The irritation to stomach and rectum is largely remedied by combining with soap or an alkaline carbonate.

USES.—Costiveness (dependent upon weakness of muscular layer of the large intestine), atonic dyspepsia, jaundice, nonactive hemorrhoids, amenorrhœa, ascarides. For the two last may give by enema.

RECAPITULATION No. 1.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Gigartinaceæ: 1. Chondrus. 2. Chondrus (Irish Moss, Carragheen).	Chondrus crispus, and Gigartina mamillosa.	The entire plant.	Atlantic Ocean.	Mucilage, albuminoids, minerals.	....	Demulcent, nutritive, dietetic.	Bronchitis, diarrhœa, kidney and bladder trouble, scrofula.	60–120 (4–8 Gm.)
Hypocreaceæ: 1. Ergota. 2. Ergot (Ergot of Rye).	Claviceps purpurea.	The sclerotium.	Russia, Spain.	Fixed oil, ergotinine, cornutine, sclerotic acid, mycose, proteids, cholesterin.	Fluid extr., extr., wine.	Emmenagogue, ecbolic, hæmostatic, excitomotor, poisonous.	In labor, dysmenorrhœa, polypi, amenorrhœa, hemorrhages, hemorrhoids.	15–60 (1–4 Gm.)
Parmeliaceæ: 1. Cetraria. 2. Cetraria (Iceland Moss).	Cetraria islandica.	The dried lichen.	N. Hemisphere.	Lichenin, isolichenin, cetrarin, lichenstearic acid.	Decoction.	Demulcent, tonic, nutritive.	Catarrhs, bronchitis, diarrhœa, consumption, constipation.	30–60 (2–4 Gm.)
Polypodiaceæ: 1. Aspidium. 2. Aspidium (Male Fern).	Dryopteris: Filix-mas, marginalis.	The rhizome.	N. America, N. Asia, Europe.	Filicic acid, filicin, fixed oil, filitannic acid, vol. oil, resin.	Oleoresin.	Tænifuge.	Tape-worms.	30-120 (2–8 Gm.)
Lycopodiaceæ: 1. Lycopodium. 2. Lycopodium.	Lycopodium clavatum +.	The spores.	Europe, Asia, N. America.	Fixed oil, cane sugar, volatile base (methylamine).	....	Diuretic, antispasmodic for rheumatism, epilepsy, pulmonary, renal disorders.	Externally for erysipelas, eczema, herpes, ulcers, chafing, to prevent adherency of pills and suppositories.	
Pinaceæ (Coniferæ): 1. Terebinthina. 2. Turpentine.	Pinus palustris +.	The concrete oleoresin.	S. United States.	Volatile oil, resin, bitter principle, formic, succinic, and other acids.	*Oil:* Recti. oil, liniment, terebene, terpin hydrate, canthar. cerate, *Resin:* res. cerate, res. plaster.	Stimulant, carminative, cathartic, anthelmintic, hæmostatic, expectorant, antiseptic, diuretic, rubefacient.	Bronchitis, catarrh, cystitis, gleet, urinary troubles, piles, hemorrhages, erysipelas, worms, pneumonia, rheumatism, renal colic, sprains, scabies.	15–60 (1–4 Gm.)
1. Terebinthina Canadensis. 2. Canada Turpentine.	Abies balsamea.	The oleoresin.	N. America.	Volatile oil, resin, bitter principle.	Flexible collodion.	Stimulant, counter-irritant, support.	....	15–60 (1–4 Gm.)
1. Pix Burgundica. 2. Burgundy Pitch.	Abies Abies (excelsa).	Resinous exudation.	S. Europe.	Volatile oil, resin.	Plaster, cantharidal pitch plaster, iron plaster, opium plaster.		Rheumatism, pleurisy. bronchitis, catarrh, asthma, phthisis, pneumonia.	Mostly externally.
1. Oleum Juniperi. 2. Oil of Juniper.	Juniperus communis.	Volatile oil.	N. America.	Pinene, $C_{10}H_{16}$, cadinene, $C_{15}H_{24}$.	Spirit, comp. spt.	Stimulant, diuretic, anodyne, antiseptic, emmenagogue, carminative.	Renal dropsy, urinary catarrh, rheumatism, swellings.	Minims. 5–15 (.8–1 Cc.)
1. Oleum Cadinum. 2. Oil of Cade.	Juniperus Oxycedrus.	Volatile oil.	S. Europe.	Phenols, cadinene, $C_{15}H_{24}$.	....		Psoriasis, pityriasis rubra, eczema.	3–5 (.2–.3 Cc.)

1. **Sabina.** 2. **Savine.**	**Juniperus Sabina.**	The tops.	**Siberia, Europe.**	**Volatile oil, resin, tannin.**	**Fluid extract, oil.**	Diuretic, emmenagogue, irritant, hæmagogue, vermifuge.	**Amenorrhœa, menorrhagia, sterility, chlo**rosis, rheuma'm, gout, warts, ulcers, polypi.	Grains. 5–15 (.3–1 Gm.)
Gramin(ac)eæ:								
1. **Zea.** 2. **Zea** (Corn Silk).	**Zea Mays.**	The styles and stigmas.	S. America.	**Maizenic acid, fixed oil, resin, sugar, mucilage, salts.**	....	Diuretic, lithontriptic, demulcent, anodyne, alterative.	Cystitis, uric acid and phosphates, gravel, gonorrhœa, dropsy from heart.	30–120 (2–8 Gm.)
1. **Amylum.** 2. **Starch.**	....	**The fecula of the seed.**	....	$(C_6H_{10}O_5)_3$.	Glycerite.	Nutritive, demulcent.	Allays itching, urticaria, erysipelas, inflamed rectum, bladder, protective.	30–120 (2–8 Gm.)
1. **Saccharum.** 2. **Sugar (Cane Sugar).**	**Saccharum officinarum, also species of Sorghum and Beta.**	**The juice evaporated and crystallized.**	**S. Asia.**	$C_{12}H_{22}O_{11}$.	**Syrup, many troches and medicated syrups, pills, powders, etc.**	**Demulcent, lenitive, laxative, ulcerations.**	Vehicle, corrigent, preservative, antiseptic, excipient, coughs, hiccough, ascarides, ulcers, sores, eye troubles.	Ad libitum.
1. **Triticum.** 2. **Triticum (Couch Grass).**	**Agropyron repens.**	**The rhizome.**	**Europe, N. America.**	**Triticin, fruit sugar, inosit, glucose, malates, lactic acid.**	**Fluid extract.**	**Diuretic, aperient, demulcent.**	Cystitis, gravel, jaundice, bronchitis, gout, skin troubles, fevers.	30–180 (2–12 Gm.)
Araceæ:								
1. **Calamus.** 2. **Calamus (Sweet Flag).**	**Acorus Calamus.**	**The rhizome.**	**N. America.**	**Volatile oil, acorin, acoretin, calamine, starch, resin.**	**Fluid extract.**	**Stimulant, carminative, tonic, bitter, aromatic.**	Dyspepsia, colic, typh'd, coughs, flatulency, flavoring, insectifuge.	15–60 (1–4 Gm.)
Melanthaceæ:								
1. **Veratrum Viride.** 2. **Veratrum Viride (American Hellebore).**	**Veratrum viride.**	**The rhizome and roots.**	**N. America.**	**Jervine, veratroidine, pseudo-jervine, rubijervine, cevadine, resin.**	**Fluid extract, tincture.**	**Sedative, emetic, diaphoretic, errhine.**	Arterial excitement, spinal spasms, pneumonia, typhoid, heart troubles, convulsions, **tetanus, chorea, mania.**	1–4 (.06–.26 Gm.)
1. **Veratrina.** 2. **Veratrine.**	**Asagræa officinalis.**	**A mixture of alkaloids.**	**Mexico, S. America.**	**Veratrine, cevadine, cevadilline, sabadine, sabadinine.**	**Oleate, ointment.**	**Powerful irritant, sternutatory, errhine.**	**Neuralgia, headache, sciatica, pediculi, rheumatism, pneumonia, sprains, heart-trouble.**	**$\frac{1}{32}$–$\frac{1}{12}$ (.002–.005 Gm.)**
Liliaceæ:								
1. **Allium.** 2. **Garlic.**	**Allium sativum.**	**The bulb (fresh).**	**Asia, S. Europe.**	**Volatile oil, mucilage, albumin, sugar.**	**Syrup.**	**Stimulant, diuretic, expectorant, anthelmintic, rubefacient.**	**Bronchitis, indigestion,** catarrh, coughs, pneumonia, abscess, earache, serpent-wounds.	**30–60 (2–4 Gm.)**
1. **Scilla.** 2. **Squill.**	**Urginea maritima.**	**The bulb.**	**Mediterranean Basin.**	**Scillitin, sinistrin, sugar, Ca oxalate.**	**Vinegar, syrup, fld. extr., compd. syrup, tincture.**	**Expectorant, cardiac stimulant, diuretic, emetic, cathartic, irritant.**	Croup, coughs, bronchitis, asthma, dropsies, whooping-cough.	**1–5–10 (.06–.3–.6 Gm.)**
1. **Aloe Socotrina.** 2. **Socotrine Aloes.**	**Aloe Perryi.**	**The inspissated juice.**	**E. Africa, Socotra.**	**Aloin, resin, volatile oil, emodin.**	**Extr., *Purif. Aloes:* pills, p. a. et asaf., p. a. et fer., p. a. et mast., p. a. et myr., tinct., tr. a. et myr., extr. coloc. co., pil. rhei co., tr. benz. co.**	**Cathartic, drastic, emmenagogue, vermifuge.**	**Costiveness, jaundice, hemorrhoids, amenorrhœa, ascarides.**	**½–10 (.03–.6 Gm.)**

ALOE BARBADENSIS. BARBADOES ALOES.

Aloe vera, (*Linné*) *Webb.* } The inspissated juice of the leaves.

Habitat. India, N. E. Africa. Naturalized in Barbadoes Islands. Dutch W. Indies. Cultivated in Italy, Sicily, Malta.

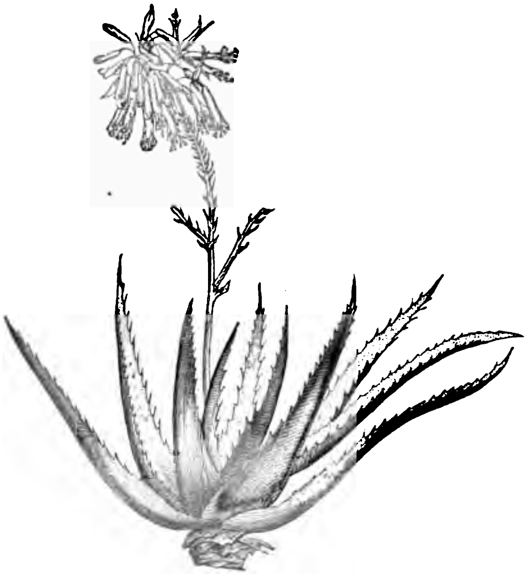
Syn. East Indian, India, Bitter, Hepatic, or Horse Aloes. Fr. Aloès hépatique des Barbades. Ger. Barbadoes Aloe.

Bar-ba-den'sis. L. of Barbadoes, one of W. Indian Islands; *i. e.*, its habitat.

Ve'ra. L. *verus*, true; *i. e.*, the original and true primitive kind.

Plant.—This is known also as *A. vulgaris* and has a short woody stem; leaves thick, glaucous-green color, mottled with darker spots, armed with reddish spines; flowers yellow. This plant produces most of the aloes used, then comes in order *A. Perryi*, *A. purpura'scens*, *A. arbore'scens*, etc., all of which are cultivated now in the poorer soils of Jamaica, Curaçao, Barbadoes, etc.; occurs in hard masses, orange-brown, powder dull olive-yellow, opaque, fracture resinous, conchoidal; strong saffron odor; taste very bitter, crystalline; more active than Socotrine. *Tests:* 1. With nitric acid get red color. 2. With sulphuric acid + nitric acid vapor, get no change unless Natal aloes present, then have deep-blue. The Bonare and Curaçao aloes are also from *A. vera* (*vulgaris*), but are very glossy. It is imported in gourds 5–15 lbs. (2.3–7 Kg.) each, mainly from Curaçao, some, however, from Barbadoes. Dose, gr. ½–10 (.03–.6 Gm.).

Fig. 42.



Aloe vera (vulgaris).

Constituents, Properties, and Uses; about the same as those of Socotrine aloes.

Allied Products:

1. *Cape Aloes, Shining Aloes* (*Aloe spica'ta* (*cape'nsis*), *Spiked Aloes*).—Flowers in spikes, official, 1850–1880. This is also possibly from *A. fe'rox*, *A. africa'na*, *A. plica'tilis*, etc. Cape of Good Hope. Has fracture shining, conchoidal, dark-olive color; imported in casks and boxes.

2. *Hepatic Aloes.*—This name was formerly applied to a variety of

Socotrine aloes from E. Indies, but now the term is given in this country to Barbadoes, in fact to any opaque liver-covered aloes.

3. *Natal Aloes.*—This has a greenish-slate hue, crystalline, fracture less shining than, but odor of Cape aloes; it is of little value, and is shipped from Port Natal.

4. *Moka Aloes.*—This has brownish-black color, irregular fracture, disagreeable odor, and is from the interior of Arabia.

5. *Caballine* or *Horse Aloes.*—This is inferior, impure, having a dark color, fetid odor, being from irregular sources.

6. *Jafferabad Aloes.*—This has black-pitch color and lustre, glassy, porous fracture, and is less agreeable than Socotrine aloes.

Allied Plants:

1. *Erythro'nium america'num, Yellow Adder's-tongue.*—The root and herb official, 1820–1850.—United States. Perennial herb, scape 15–22.5 Cm. (6–9′) high, slender, leaves 2, pale-green, equal length 12.5 Cm. (5′), one twice as wide as the other, brown-spotted, flowers yellow, 2.5–5 Cm. (1–2′) long, root (bulb or corm) solid, brown; inside white. All parts of the plant active; used like colchicum. Dose, gr. 20–30 (1.3–2 Gm.) in infusion. Large doses emetic.

11. CONVALLARIACEÆ. Lily-of-the-Valley Family.

Kon-va-la-ri-a'se-e. L. *Convallari-a* + aceæ, fr. L. *con*, together, + *vallis*, valley—a valley enclosed on all sides; *i. e.*, alluding to the preferred place of growth of some species. Leafy-stemmed, erect herbs. Distinguished by having branched rootstocks, never bulbs or corms; leaves broad, parallel-veined, perianth 6-lobed or toothed, stamens 6, ovary 2–3-celled, superior; fruit fleshy berry, stigma 3-lobed; temperate climates; purgative, emetic, diuretic, diaphoretic, alterative, poisonous.

Genera: 1. **Convallaria.** 2. **Colchicum.**

CONVALLARIA. CONVALLARIA.

Convallaria majalis, *Linné.* } The rhizome and roots.

Habitat. United States (Allegheny Mountains, Virginia, South Carolina), Europe, Asia; cultivated in gardens.

Syn. Lily of the Valley, Lilium Convallium; Fr. Muguet; Ger. Maiblumen.

Con-val-la'ri-a. See etymology, above, of Convallariaceæ.

Ma-jal'is. L. gelded, emasculated; *i. e.*, its stem.

PLANT.—Stemless perennial; leaves 2–3, radical; smooth, elliptical; flowers May, one-sided raceme of ten, bell-shaped, white, 6-lobed, 6 Mm. ($\frac{1}{4}$′) long, cultivated larger, sweet-scented, bitter taste, nodding on an angled scape; fruit red berries. RHIZOME, horizontal, 3 Mm. ($\frac{1}{8}$′) thick, internodes 2.5–7.5 Cm. (1–3′) long, wrinkled, whitish, few circular scars, joints annulate, beset with 8–10 thin roots, 1 Mm. ($\frac{1}{25}$′) thick, fracture fibrous, white; odor peculiar, pleasant; taste sweet, bitter, acrid. *Solvents:* diluted alcohol; boiling water partially. Dose, gr. 2–10 (.13–.6 Gm.).

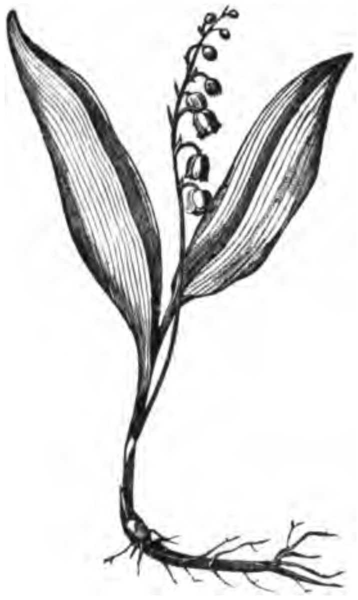
Commercial.—Our plant is identical with that grown in European gardens. Rhizome should be collected July–Aug., washed and carefully dried in the sun, thereby losing 85 p. c.

CONSTITUENTS.—Convallamarin, Convallarin, resin.

Convallamarin, $C_{23}H_{44}O_{12}$.—Bitter glucoside (cardiac constituent), obtained by precipitating alcoholic tincture with basic lead acetate; filter, evaporate, dilute with water, neutralize with sodium carbonate, precipitate with tannin, dissolve this in alcohol (60 p. c.), decolorize with charcoal, decompose with zinc oxide, filter, evaporate; yield 0.6 p. c. It is a white powder, bitter, sweet, soluble in alcohol, water; with dilute acids converted into sugar and convallamaretin.

Convallarin, $C_{34}H_{62}O_{11}$.—Glucoside, acrid, purgative, in colorless prisms, soluble in alcohol, sparingly in water, foaming like saponin, boiled with dilute acids gives sugar and convallaretin.

FIG. 43.



Convallaria majalis.

PREPARATIONS.—1. *Extractum Convallariæ Fluidum.* Fluid Extract of Convallaria. (Syn., Fluid Extract of Lily of the Valley; Fr. Extrait liquide de Muguet; Ger. Flüssiges Maiblumenwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏ij–10 (.13–.6 Cc.).

Unoff. Preps.: Extract. Dose, gr. ½–2 (.03–.13 Gm.). *Infusion,* 25 p. c. Dose, ℥ss–1 (15–30 Cc.). Convallamarin(-um). Dose, gr. ½–2 (.03–.13 Gm.). Convallarin (purgative). Dose, gr. 3 (.2 Gm.).

PROPERTIES.—Heart tonic, emetic, purgative, diuretic, sternutatory, poisonous. Similar to digitalis, but free from cumulative action, hence thought a valuable substitute. Acts directly on the pneumogastric, finally arrests heart in systole.

USES.—Dropsy, heart disease, palpitation, disordered rhythm, weak heart, valvular affections, pneumonia, typhoid fever. Action lasts several days after use suspended. Once used for epilepsy and worms.

Poisoning, Incompatibles, Synergists: same as for digitalis.

Allied Plants:

1. *Polygona'tum (Convallaria) multiflo'rum, European Solomon's Seal,* and *P. commuta'tum (gigante'um), American Solomon's Seal.*—Rhizome similar and contains convallarin, asparagin, mucilage, starch.

2. *Va'gnera (Smilaci'na) racemo'sa, False Solomon's Seal.*—N. America.

COLCHICUM. COLCHICUM.

1. Colchici Radix. Colchicum Root.
2. Colchici Semen. Colchicum Seed.

Colchicum autumnale, *Linné.* } The corm and seed.

Habitat. C. and S. Europe, N. Africa (England, Greece, Turkey, Switzerland). Moist pastures and meadows.

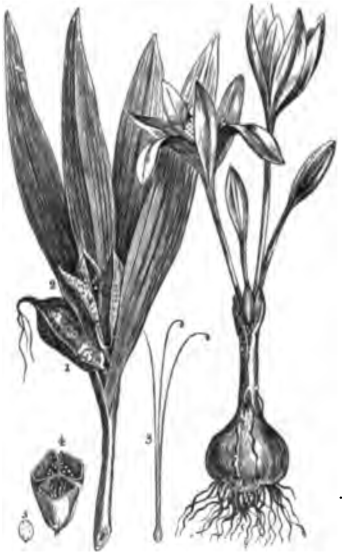
Syn. Meadow Saffron, Naked Ladies, Upstart, Colchici Cormus, Bulbus (Tuber) Colchici, Colchici Semina. Fr. Colchique, Safran bâtard, Bulbe de Colchique—de Safran bâtard, Semences de Colchique. Ger. Herbstzeitlose, Wiesensafran, Zeitlosenknollen, Semen Colchici, Zeitlosensamen.

Col′chi-cum. L. fr. Gr. κολχίς, Colchis. An ancient province in Asia Minor, east of Black Sea, where this poisonous plant flourished; also the home of Media, the Sorceress and poisoner of ancient legend.

Au-tum-nal′e. L. *au(c)tumnalis*, belonging or peculiar to autumn; *i. e.*, the plant blooms Sept.-Oct., covering meadows with saffron-colored flowers resembling a carpet.

Plant.—Bulbous perennial, several inches high; leaves radical, 3–5, sheathing 15–30 Cm. (6–12′) long, 2.5–5 Cm. (1–2′) wide, erect, entire, strap-shaped, smooth, shiny dark-green; flowers 2–6, large, lilac-purple, resembling crocus except anthers extrorse; corolla tube 12.5–15 Cm. (5–6′) long, two-thirds being under ground; fruit of 3 inflated follicles, united at base, 4 Cm. ($1\frac{1}{2}$′) long, brown, papery, dehiscent; seeds numerous. Corm, 25 Mm. (1′) long, 18 Mm. ($\frac{3}{4}$′) thick, ovoid, convex on one side, flattish, with a groove on the other, externally brownish, wrinkled, internally white and solid; usually in transverse reniform slices 2 Mm. ($\frac{1}{12}$′) thick, fracture short, mealy; inodorous; taste sweetish, bitter, acrid; tissue composed of parenchyma, starch granules, fibro-vascular bundles, and spiral ducts. Seed, 2 Mm. ($\frac{1}{12}$′) thick, slightly pointed at hilum, reddish-brown, pitted, internally whitish, very hard, tough; inodorous, bitter, acrid. *Solvents:* diluted alcohol; vinegar, wine. Dose, Corm gr. 2–8 (.13–.5 Gm.). Seed gr. 1–5 (.06–.3 Gm.).

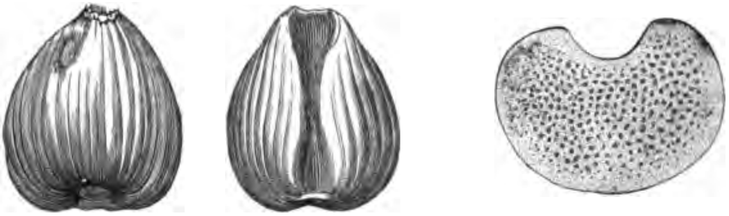
Fig. 44.



Colchicum autumnale; 1, closed capsule; 2, open capsule; 3, styles; 4, cross-section of capsule; 5, seed.

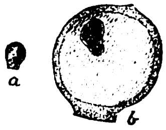
Commercial.—The entire plant has medical properties; resembles our garden tulips, and requires two years for the cycle of complete development. Planting the bulb in the spring, by fall a new cormus is formed on the lateral inferior portion of old one, this latter still embracing it half around; the new cormus takes the place of old one, sending downward roots and upward a spathe from which in Sept.–Oct. emerge flowers, but as yet no leaves; the lower corolla tube is underground, whitish, perishing by Nov., the fruit rudiment (ovary) remains underground until following spring, when it rises on stem in shape of a 3-lobed, 3-celled capsule, bringing along with it the first leaves; the corm is most active when a year old, and should be collected June–Aug., of second year, after seeds are ripe and just before the sprouting forth of the fall flowers from newly forming cormus; it is then most developed and least exhausted from the formation of new bud and soon to be evolved corm, provided it be left in the ground. It is now dug, washed, sliced and dried by sun or fire (65° C.; 150° F.). These corms resemble tulip bulbs, except the latter are made up of concentric scales; the loss upon drying is 70 p. c. The seeds are the most concentrated portion of plant; should be collected when fully ripe, July–Aug. Their horny albumin renders powdering difficult, which is best accomplished in a mill with hardened plates; if pestle and mortar used seed must be very dry or be macerated in their menstruum to soften, so as to mash easily. Unless very fine, cold solvents only extract one-third of their colchicine, but hot solvents exhaust irrespective of fineness. England and Germany furnish our supply, the quality being usually determined simply by the degree of bitterness.

FIG. 45.



Colchicum tuber (corm); front and rear view, also transverse section.

FIG. 46.



Colchicum seed; *a*, natural size; *b*, section magnified.

CONSTITUENTS.—Colchicine 0.5 p. c., (Colchicein), Colchicoresin, Beta-colchicoresin, starch, sugar, fixed oil (seeds 5–6 p. c.), gum, ash 2.6 p. c.

Colchicine, $C_{22}H_{25}NO_6$.—Alkaloid prepared by exhausting with alcohol, diluting with water, filtering, precipitating coloring-matter with lead subacetate, removing lead with sodium phosphate, precipitating colchicine with tannin; can now digest washed tannate with lead oxide, dry and dissolve out colchicine with alcohol. Occurs in whitish, amorphous powder or crystals, saffron odor, bitter taste; changed by most acids into colchicein; aqueous solution with hydrochloric acid is yellow. It is the methylic ether of colchicein, $C_{21}H_{23}NO_6 + \frac{1}{2}H_2O$, both being soluble in water, alcohol, chloroform, and with potassa give yellow solutions, precipitated by tannin; best form for general use. Dose, gr. $\frac{1}{130}$–$\frac{1}{30}$ (.0005–.002 Gm.).

Colchicoresin, $C_{51}H_{60}N_2O_{15}$.—Brown, amorphous, soluble in chloroform, alcohol; insoluble in ether, sparingly in cold water.

Beta-colchicoresin, $C_{34}H_{39}NO_{10}$.—Blackish-brown, soluble in chloroform, strong alcohol; insoluble in water or ether. These last two are but slightly affected by tannin, are brownish-green by ferric chloride, and dissolve in potassa with a brown color.

PREPARATIONS.—I. ROOT: 1. *Extractum Colchici Radicis.* Extract of Colchicum Root. (Syn., Br. Extractum Colchici Aceticum; Fr. Extrait de Colchique Acétique; Ger. Zeitlosen Essig-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with acetic acid 35 Cc., water 150, finishing with latter q. s. Dose, gr. ½–2 (.03–.13 Gm.).

2. *Extractum Colchici Radicis Fluidum.* Fluid Extract of Colchicum Root. (Syn., Fr. Extrait liquide de Bulbe de Colchique; Ger. Flüssiges Zeitlosenknollen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏ij–8 (.13–.5 Cc.).

3. *Vinum Colchici Radicis.* Wine of Colchicum Root. (Syn., Br. Vinum Colchici; Fr. Vin (Œnolé) de bulbe de Colchique; Ger. Zeitlosenknollenwein.)

Manufacture: 40 p. c. Percolate 40 Gm. with alcohol 15 Cc., white wine 85, finishing with latter q. s. 100 Cc. Dose, ♏v–15 (.3–1 Cc.).

II. SEED: 1. *Extractum Colchici Seminis Fluidum.* Fluid Extract of Colchicum Seed. (Syn., Fr. Extrait liquide de Semence de Colchique; Ger. Flüssiges Zeitlosensamen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏j–5 (.06–.3 Cc.).

2. *Tinctura Colchici Seminis.* Tincture of Colchicum Seed. (Syn., Tinctura Colchici; Fr. Teinture (de Semences) de Colchique; Ger. Zeitlosentinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with alcohol 60 p. c., q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

3. *Vinum Colchici Seminis.* Wine of Colchicum Seed. (Syn., Fr. Vin (Œnolé) de Semence de Colchique; Ger. Vinum Colchici, Zeitlosensamenwein.)

Manufacture: 15 p. c. Macerate 15 Gm. with alcohol 15 Cc., white wine 85, finishing with latter q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

PROPERTIES.—Alterative, cathartic, emetic, sedative, diuretic, diaphoretic irritant. Small doses increase secretions generally (urine, sweat, etc.); normal doses only produce pains and loose bowels. Excessive doses cause persistent purging, tenesmus, nausea, vomiting, thirst, cold extremities, weak pulse, prostration, headache, delirium, stupor, death by gastro-enteritis, or cardiac paralysis.

USES.—Gout, rheumatism, especially if neuralgic, increases urea and uric acid elimination from blood, prurigo, urticaria, other gouty cutaneous troubles. Should be given with an alkali, pushing it just short of nausea, and before beginning with it the bowels should be moved with magnesium sulphate, oxide or carbonate. Repeated attacks render larger doses necessary, and it may lose entirely its effect. Colchicum was used by the ancients in gout, etc., but falling into disfavor was revived by Störck as a diuretic, expectorant in dropsy, asthma. Again growing into odium, became reëstablished by Want, who thought it a component of *Eau médicinale d'Husson*, a celebrated gout cure.

Poisoning: Evacuate stomach if not already done, give tannin, morphine, demulcent drinks, stimulants. *Incompatibles:* Alcohol, opium (antagonizes cardiac depression), tannin, vegetable infusions. *Synergists:* Diuretics, purgatives, emetics, alkalies.

Allied Plant:

1. *C. variega'tum*, *Oriental Hermodactyls.*—S. Europe, Asia Minor. Corm like official, but surface smooth, whitish to black, bitter, insipid.

12. SMILACEÆ. Smilax Family.

Smi-la'se-e. L. *Smil-ax* + aceæ, fr. Gr. σμίλη, a scraper; alluding to the rough, prickly stems. Mostly vines, woody or herbaceous, stems often prickly. Distinguished by 3–5-nerved (net-veined) leaves, punctate; flowers 6's, umbels, anthers 2-celled, extrorse, ovary 3-celled; fruit globose-berry containing 1–6 brownish seeds; warm and temperate climates; alterative, diuretic, diaphoretic.

Genus: 1. **Smilax.**

SARSAPARILLA. SARSAPARILLA.

Smilax {
officinalis, *Humboldt and Kunth,*
medica, *Schlechtendal et Chamisso,*
papyracea, *Duhamel,*
and other undetermined species.
} The root.

Habitat. Tropical America, Mexico to Brazil; swampy forests.

Syn. 1. Jamaica, Honduras, Spanish, Guayaquil, Red or Officinal Sarsaparilla. 2. Mexican or Vera Cruz Sarsaparilla. 3. Brazilian, Caracas, Guatemala, Lisbon or Rio Negro Sarsaparilla. Br. Sarsæ Radix. Fr. Sarsepareille. Ger. Radix Sarsaparillæ, Sarsaparille.

Smi'lax. L. Bindweed, Gr. σμῖλαξ, the yew, fr. σμίλη (Eng. smile), a scraper; *i. e.*, stems rough with prickles.

Of-fi-ci-na'lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

Med'i-ca. L. *medicus*, medical, curative; *i. e.*, its healing properties.

Pap-y-ra'ce-a. L. *papyraceus*, fr. *papyrus; i. e.*, leaves and pith can be used to write upon.

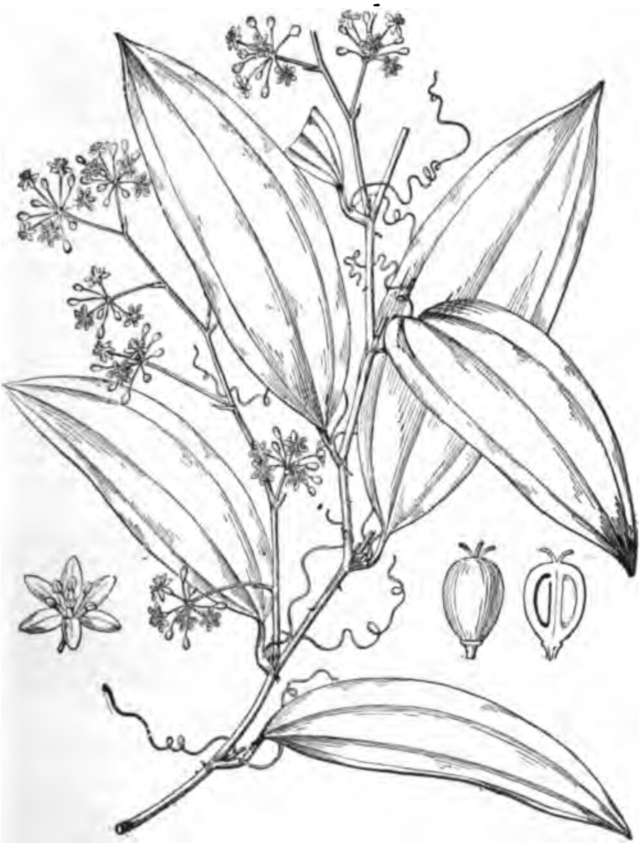
Sar-sa-pa-ril'la. L. fr. Sp. *zarzaparilla*—*zarza*, a bramble, + *parra*, a vine, or from *Parillo*, a physician said to have discovered and employed it.

PLANTS.—Large perennial climbers; rhizomes short, thick, knotted, nodes thick, from which spring purplish-white roots 2–2.5 M. (6–8°) long, and a few rootlets; stems many, stiff, woody, angular, ridged, subterete or quadrangular, prickles at nodes; leaves 10–30 Cm. (4–12′) long, 7.5–15 Cm. (3–6′) wide, petioles 5 Cm. (2′) long, quadrangular, cordate, rounded lobes at base, entire, glabrous, leathery, dark glossy green; flowers diœcious, 10–20 together in umbels; fruit small berry, 8 Mm. ($\frac{1}{3}$′) thick, red, 2–3-seeded. ROOT, 5 Mm. ($\frac{1}{5}$′) thick, size of goose-quill, cylindrical, longitudinally wrinkled, grayish-brown or orange-brown, inside showing whitish, mealy, somewhat horny cortical layer, surrounding a circular wood-zone, this latter enclosing broad pith; nearly inodorous; taste mucilaginous, bitter, acrid; the thick, woody, knotty rhizome should be rejected. *Solvents:* diluted alcohol or boiling water extracts the virtues which are injured by continued boiling. Dose, ʒss–2 (2–8 Gm.).

Commercial.—Sarsaparilla was carried to Europe from Peru, St. Domingo, Brazil, by the Spaniards in 1550, and has been generally used ever since.

S. officinalis.—Jamaica Sarsaparilla; this is also cultivated and found in Colombia, Guatemala, Peru, C. America on Chiriqui Mountains, 1200–2400 M. (4000–8000°) elevation.

FIG. 47.



Smilax, branch with flowers and fruit.

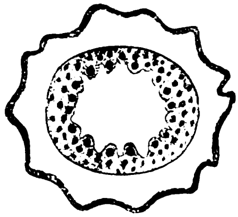
S. papyracea.—Para, Lisbon Sarsaparilla, is a variety of *S. officinalis*, with older stems, lower branches remaining square, angles having flattened prickles, leaves much more membranaceous, found in Guiana, N. Brazil.

S. medica.—Vera Cruz. Mexican sarsaparilla. Grows in Mexican Andes, around Orizaba, Vera Cruz, etc., is a variety of *S. officinalis*, having slender branches, frequently no prickles. Besides these the root is taken from *S. syphili'tica* (Colombia), *S. glau'ca* (Mexico, United States) and *S. orna'ta* (C. America). Collect roots by grubbing, pulling, etc., taking care to leave enough at each plant to insure future growth. Most of roots are horizontal and shallow, yet so numerous, so matted, and undergrowth so thick, that careful digging is troublesome. Full-grown plants often yield at first cutting 30–60 lbs. (13.6–27 Kg.), and every two years thereafter smaller quantities of more slender, less starchy roots. Collectors recognize as best that having many roots from stem, persistent acrid taste, prickles closely set, leaves thin. When dug roots are dried and packed in bundles. We have two varieties dependent upon physical properties: 1. *Mealy;* 2. *Non-mealy;* and each has subdivisions turning on shipping-point; the former more or less swollen, pale-yellow, transversely cracked, starch considerable, usually in fine granules, seldom pasty; the latter thin, not cracked, red or brown, starch little if any, usually pasty, rarely in granules, more horny, with longitudinal and irregular folds. This is considered best as the roots produce a greater number of rootlets, are more acrid and yield most extract, which is entirely dissolved by cold water, forming a clear solution.

FIG. 48.

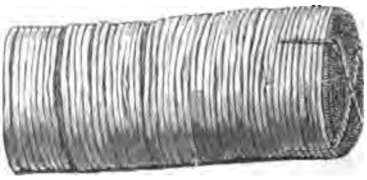
Honduras sarsaparilla.

FIG. 49.



Honduras sarsaparilla; cross-section, magnified 3 diam.

FIG. 50.



Rio Negro sarsaparilla; cross-section, magnified 3 diam.

To the mealy belong:

1. *Honduras* (*S. officinalis*).—The most popular here, comes from Honduras Bay in subcylindrical bundles, .6–1 M. (2–3°) long, composed of several roots folded lengthwise and fastened by a few circular turns; in bales or skins 100 lbs. (45.3 Kg.), or more each; amylaceous when broken.

1. *Rio Negro, Para, Lisbon* (*S. papyracea*).—Not plentiful, from Para, Maranham, in cylindrical bundles, .3–1.5 M. (1–5°) long, 20–30 Cm. (8–12′) thick, closely, neatly wrapped with a climbing plant stem,

evenly cut off at both ends, rootlets few, interior very amylaceous, acrid.

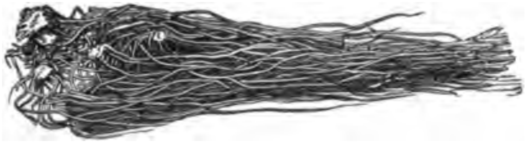
3. *Guatemala* (*S. papyracea*).—Grows 100 miles (160 Km.) from ocean in Sacatapeques province. Occurs in bundles .6–1 M. (2–3°) long, 10 Cm. (4′) thick, composed of separate roots laid parallel and bound by few turns of a flexible stem, very amylaceous, sharp taste.

4. *Caracas* (*S. officinalis*).—Resembles Para, being very amylaceous.

To the non-mealy belong:

1. *Mexican, Vera Cruz, Tampico* (*S. medica*).—Consists of rhizome with numerous long roots folded back over it, to which stem portions are often adherent; conical shape, not tied by convolutions, each one separate, pith and woody-zone equal thickness, once thought valueless, but owing to acridity now considered valuable, is often filled with earth.

FIG. 51.

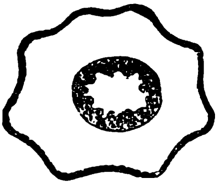


Mexican sarsaparilla.

2. *Jamaica, Red* (*S. orna'ta*).—Mostly from S. America via Jamaica; resembles Honduras, but redder, less amylaceous, and yields more extract; occurs in loose bundles .3–.5 M. (12–18′) long, 10–12.5 Cm. (4–5′) thick, composed of long slender roots folded up, with many attached fibres (bearded sarsaparilla) little wrinkled. Mostly from Amazon valley.

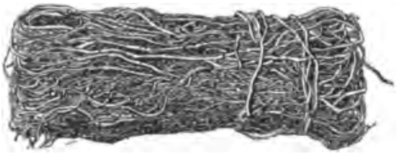
3. *Guayaquil* (*S. officinalis*).—Grows in W. Andes valleys, usually loose and carelessly packed in bales, rhizome and stem portions often present, roots dark with much fibre, bark furrowed, thick, more or less amylaceous, inside pale-yellow.

FIG. 52.



Mexican sarsaparilla; cross-section, magnified 3 diam.

FIG. 53.



Jamaica sarsaparilla.

CONSTITUENTS.—Parillin 0.2 p. c., Saponin, Sarsa-saponin, volatile oil, resin, starch, coloring-matter, calcium oxalate and other salts.

Parillin (smilacin, parillic acid, pariglin, salseparin, parillinic acid), $C_{26}H_{44}O_{10} + 2\frac{1}{2}H_2O$.—Obtained by exhausting with warm alcohol, distilling to $\frac{1}{6}$ weight of root taken, adding $1\frac{1}{2}$ times weight of water, after several days decant from yellow precipitate, which mix with $\frac{1}{2}$

volume alcohol and wash on filter with 20 p. c. alcohol. It is a white glucoside resembling saponin, bitter when dissolved in alcohol or water, frothing when agitated, with sulphuric acid gives yellow solution, turning cherry-red; aqueous solutions precipitated by lead acetates, tannin; boiled with dilute acids splits into sugar and parigenin.

Saponin, $5(C_{20}H_{32}O_{10} + 2\frac{1}{2}H_2O)$.—Glucoside, soluble in water.

Sarsa-saponin, $12(C_{22}H_{36}O_{10} + 2H_2O)$.—Glucoside, soluble in water; most poisonous of all constituents.

PREPARATIONS.—1. *Decoctum Sarsaparillæ Compositum.* Compound Decoction of Sarsaparilla. (Syn., Br. Decoctum Sarsæ Compositum; Fr. Tisane (Apozème) Sudorifique, Décocté de Salsepareille Composé; Ger. Zusammengesetztes Sarsaparilla Decoct.)

Manufacture: 10 p. c. Sarsaparilla 10 Gm., sassafras 2, guaiacum wood 2, glycyrrhiza 2, mezereum 1, water q. s. 100 Cc. Dose, ℥j–4 (30–120 Cc.).

2. *Extractum Sarsaparillæ Fluidum.* Fluid Extract of Sarsaparilla. (Syn., Br. Extractum Sarsae Liquidum; Fr. Extrait Liquide de Salsepareille; Ger. Flüssiges Sarsaparilla-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 35 p. c., q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Prep. 1. *Syrupus Sarsaparillæ Compositus.* Compound Syrup of Sarsaparilla. (Syn., Syrupus Sudorificus; Fr. Sirop de Salsepareille Composé, Sirop sudorifique; Ger. Zusammengesetzter Sarsaparillsirup.)

Manufacture: Fld. extr. sarsaparilla 20 Cc., fld. extr. glycyrrhiza 1.5, fld. extr. senna 1.5, sugar 65 Gm., oil of sassafras .01 Cc., oil of anise .01, oil of gaultheria .01, water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

3. *Extractum Sarsaparillæ Fluidum Compositum.* Compound Fluid Extract of Sarsaparilla. (Syn., Fr. Extrait liquide de Salsepareille Composé; Ger. Zusammengesetztes Flüssiges Sarsaparilla-Extrakt.)

Manufacture: 75 p. c. Macerate, percolate sarsaparilla 75 Gm., glycyrrhiza 12, sassafras 10, mezereum 3, with glycerin 10 Cc., alcohol 30, water 60, finishing with the two latter in the same proportion, q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 5–10 (.3–.6 Gm.). *Extract Comp. Decoction. Syrup.*

PROPERTIES.—Alterative, diuretic, diaphoretic, tonic. Mostly believed to be of little service, unless associated with other drugs, such as potassium iodide, guaiac, sassafras, mezereum, etc.

USES.—As a blood purifier in scrofula, cutaneous diseases, abscesses, ulcers, tertiary syphilis with mercuric chloride or potassium iodide or both; gout, rheumatism.

Incompatibles: Alkalies, iodine, and corrosive sublimate is claimed to be converted into calomel by the compound syrup.

Allied Plants:

1. *S. chi'na, S. pseu'do-chi'na, S. tamnoi'des,* and *S. a'spera.*
2. *Ca'rex arena'ria, German Sarsaparilla.*—All used like official.

13. IRIDACEÆ. Iris Family.

Ir-i-da′se-e. L. *Iri(s)d* + aceæ, fr. Gr. Ἶρις, the rainbow, the goddess of the rainbow ; *i. e.*, alluding to the bright and varied-colored flowers. Herbs. Distinguished by having bulbs, corms or rhizomes ; leaves equitant, 2-ranked, parallel-veined ; flowers 6-cleft, perfect, petaloid, regular or irregular, tube coherent with the 3-celled inferior ovary ; stamens 3, distinct or monadelphous ; anthers innate, extrorse ; fruit 3-celled, 3-valved capsule ; temperate climates, tropics ; purgative, emetic, antispasmodic, carminative, poisonous.

Genera : 1. **Iris.** 2. **Crocus.**

IRIS. IRIS (BLUE FLAG).

Iris versicolor, *Linné.* } The rhizome and roots.

Habitat. N. America in swampy places (Newfoundland to Florida, west to Minnesota, Arkansas).

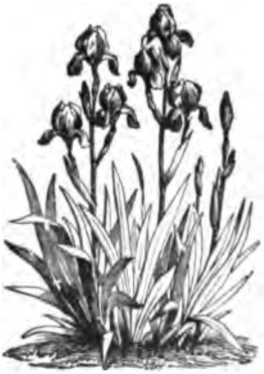
Syn. Poison or Water Flag, Water-, Flag-, Liver-, or Snake-Lily, Fluer-de-lis, Flower-de-luce. Fr. Rhizome d'Iris varié, Flambe veriée, Glaïeul bleu. Ger. Verschiedenfarbige Schwertlilie, Amerikanischer Schwertel.

I′ris. L. see etymology, above, of Iridaceæ.

Ver-sic′ol-or. L. *versare*, to change, + *color*, color, various colors ; *i. e.*, the flowers are changeable or vary much in color.

PLANT.—Perennial herb ; stem .6–1 M. (2–3°) high, angled on one side, branched, with 2–6 large beautiful flowers ; leaves sword-shaped, .6–1 M. (2–3°) long, 12–25 Mm. (½–1′) broad, sheathing at base ; flowers May–June, 5–7.5 Cm. (2–3′) long, funnel-shaped, purplish-blue, fruit capsule, oblong, with 3 rounded angles. RHIZOME, horizontal, with joints, 5–10 Cm. (2–4′) long, cylindrical in lower half, flattish, 20 Mm. (⅘′) broad near upper extremity, terminated by circular scar, annulated from the leaf-sheaths, gray-brown ; roots long, simple, crowded near broad end ; odor slight, taste acrid, nauseous. If cut into slices, dried, powdered, will keep a long time in well-stoppered bottles. *Solvents :* alcohol ; boiling water partially. Dose, gr. 5–20 (.3–1.3 Gm.).

FIG. 54.



Iris in bloom.

CONSTITUENTS.—Resin 25 p. c., camphoraceous body, possibly an alkaloid, fat, sugar, gum, tannin.

Resin.—Acrid, soluble in chloroform, ether, hot alkalies, from this latter solution reprecipitated by acids ; represents the medicinal virtues.

Supposed alkaloid is brownish, viscid ; obtained from alcoholic extract by acetic acid.

PREPARATIONS.—1. *Extractum Iridis.* Extract of Iris. (Syn., Fr. Extrait d'Iris varié ; Ger. (Verschiedenfarbige) Schwertlilie-Extrakt.)

Manufacture: Macerate, percolate with alcohol. Dose, gr. 1–4 (.06–.26 Gm.).

2. *Extractum Iridis Fluidum.* Fluid Extract of Iris. (Syn., Fluid Extract of Blue Flag; Fr. Extrait liquide d'Iris varié; Ger. Flüssiges Schwertlilie-Extrakt.)

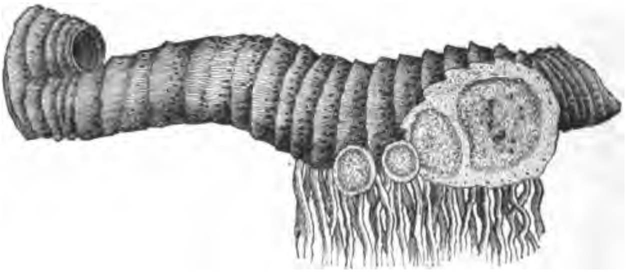
Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–20 (.3–1.3 Cc.).

Unoff. Preps.: Decoction. Tincture. Irisin (iridin). This latter is the "Eclectic's" oleoresin or resinoid, obtained by precipitating concentrated alcoholic tincture with water, then mixing dried precipitate with equal quantity of liquorice root: Dose, gr. 1–4 (.06–.26 Gm.).

PROPERTIES.—Cathartic, cholagogue, emetic, diuretic, alterative.

USES.—Was much used by our Southern Indians; now considered a good cathartic in costiveness, malarial jaundice, bilious remittent fever, dropsy, but is very nauseating and prostrating. May in some cases have a decided action on the liver, is less irritating than podophyllum, more purgative than euonymus; same is true of their resins.

FIG. 55.



Iris versicolor; joint of rhizome and section of branches.

Allied Plants:

I. florenti'na, Florentine Orris (*White Flag*).—The rhizome official, 1820–1880. N. Italy (near Florence), Germany, France. Perennial plant, leaves radical, sword-shaped, shorter than stem, which rises in their midst (.3–.6 M.; 1–2°) high, bearing two large, white or bluish flowers; fruit capsule, 3-celled, many-seeded; rhizome 5–10 Cm. (2–4′) long, 12–18 Mm. (½–¾′) thick, flattish, peeled, whitish, on upper side fibro-vascular bundles, below many brownish scars of roots, fracture short; odor violet-like; taste mealy, bitter, acrid. Contains volatile oil, starch, resin, tannin. Used as stimulant, diuretic, emetic, cathartic; fresh root irritant, for diarrhœa, bronchitis, dropsy, masticatory for perfuming breath and teething infants; for this latter the more slender pieces are peeled smoothly and whitened with chalk or magnesia. This is adulterated with the rhizomes of *I. pa'llida*, *I. germa'nica*, *I. pseuda'corus*, *I. fœtidi'ssima*, all of which are somewhat darker, more astringent and acrid.

CROCUS. SAFFRON.

Crocus sativus, *Linné.* } The stigmas.

Habitat. W. Asia. Cultivated for commerce in Spain, France, etc.

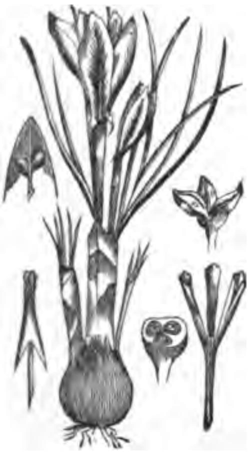
Syn. Spanish Saffron, Autumnal Crocus, Cake or Hay Saffron, Zafran, Stigmata Croci. Fr. Safran. Ger. Safran.

Cro′cus. L. fr. Gr. *κρόκος*, Heb. *karkom*, Ar. *kurkum*, saffron. A Chaldean name applied by Theophrastus, after the youth Crocus, who, by mythology, was changed into this flower, fr. *κρόκη*, a thread, because their thread-like filaments were in such demand for saffron-colored dye.

Sa-ti′vus. L. cultivated, sown ; kind used in contradistinction to the wild grown.

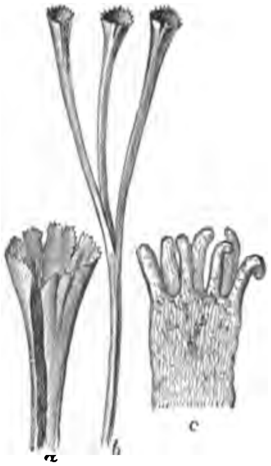
PLANT.—Perennial herb with solid, depressed-globular corm (bulb), 2.5 Cm. (1′) thick ; roots white from beneath ; buds (new corms) from top ; flowers Sept.–Oct.; lilac, bluish-purple, arising 15–20 Cm. (6–8′) above ground on a scape enveloped by spathe, perianth with tube 10 Cm. (4′) long, segments 6, about 4 Cm. (1½′) long ; leaves 6–9, radical, linear, enclosing perianth tube, 10–15 Cm. (4–6′) long. STIGMAS, 3-cleft, convolute, orange-red, attached to top of style, 3 Cm. (1⅕′) long, flattish, tubular, thread-like, broader and notched above ; odor strong, peculiar, aromatic ; taste bitter, aromatic. *Tests :* 1. Should not contain yellow styles, nor leave greasy stain on filter paper (abs. oil, glycerin, added to brighten color of inferior grades). 2. Should color saliva deep-orange, and when soaked in water should not deposit mineral matter, should give no color with benzin (abs. sodium nitrocresylate, picric acid and other coal-tar colors). 3. On drying should not lose over 14 p. c. (abs. added water), and ash should not be more than 7.5 p. c. (abs. inorganic substances). *Solvents :* diluted alcohol ; boiling water. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 56.



Crocus sativus.

FIG. 57.



Crocus ; *a*, stigma, upper part, magnified 4 diam.; *b*, style with stigmas ; *c*, papillose margin of stigma, magnified 120 diam.

ADULTERATIONS.—Florets of *Carthamus tinctorius* (corolla 5-toothed, tubular, enclosing yellow style and filaments), *Calendula officinalis* (corolla 3-toothed), and *Arnica montana*. Also dyed stamens, petals, etc., of many flowers (recognized by throwing into hot water and observing the imparted color thereto as well as shape), minerals, chalk, gypsum, heavy-spar, emery (increase ash) mixed with honey and colored, alkaline salts, oil, glycerin, dried beef fibres, exhausted stigmas, coal-tar products, mixed with 75 p. c. sodium chloride, and water, in all sometimes 20–40 p. c.

Commercial.—Saffron was found early in Greece, Asia Minor, Italy, Persia, being cultivated in Pliny's time; in Spain since tenth, and France, England, etc., since fourteenth century. We now have three varieties: 1. *Spanish, French.* 2. *Grecian.* 3. *Chinese.* The first excels in color and flavor; the second in amount of yield; the third combines these superiorities. During Sept., Oct., Nov., when plant is blooming, women go between rows, plucking the full blooms, placing them in wicker baskets on their arms. At home stigmas are removed, quickly dried in sieves over fire for half hour, 8,000 blooms yielding 17½ ozs. (½ Kg.) of fresh stigmas or 3½ ozs. (100 Gm.) of dried. This is called *hay saffron* as distinguished from *cake saffron*, which was pressed between bibulous paper and formed into cakes, but is no longer in commerce. Our supply now comes from Spain (Valencia and Alicante), France (Gatinais), Austria (sparingly), and Eastern Pennsylvania, where they grow 35 lbs. (16 Kg.) per acre, calling it American saffron, the proper name for florets of *Carthamus tinctorius*. It is imported from Gibraltar, Trieste, etc., in canisters. African saffron, flowers of *Carthamus tinctorius*, and Cape saffron from *Lype'ria cro'cea*, Scrophulariaceæ, seldom reach our markets.

CONSTITUENTS.—Volatile oil, $C_{10}H_{16}$, 1 p. c., Crocin, Picrocrocin, wax, proteids, fixed oil, mucilage, sugar, moisture 12–14 p. c., ash 5 p. c.

Volatile Oil.—This gives medical properties; obtained by distillation.

Crocin (polychroit, from its many colors), $C_{44}H_{70}O_{28}$.—Glucoside, obtained by exhausting with ether, then with water; from aqueous tincture precipitate gum with alcohol, filter, add ether, when crocin precipitates; it is amorphous, sweetish, yellowish-brown, soluble in alcohol, water, splits into sugar (crocose) and red crocetin (formerly called crocin), $C_{34}H_{46}O_9$, which is soluble in ether, alcohol, and, like crocin, blue with sulphuric acid.

Picrocrocin (saffron bitter), $C_{38}H_{66}O_{17}$.—Bitter principle, colorless needles, soluble in alcohol and water; with acids or alkalies yields crocose and volatile oil, $C_{10}H_{16}$.

PREPARATIONS.—*Tinctura Croci.* Tincture of Saffron. (Syn., Fr. Teinture de Safran; Ger. Safrantinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

Unoff. Preps.: Infusion, 2 p. c. Known by laity as saffron tea, usually made by them from *Carthamus tinctorius* (safflower), owing to cheapness. Dose, for measles, etc., ℥iv (120 Cc.) every hour. *Syrup* (little used).

Properties.—Diaphoretic, carminative, emmenagogue, antispasmodic, anodyne, sedative, stimulant, condiment.

Uses.—Dyspepsia, colic, dysmenorrhœa, to promote exanthematous eruptions in measles, etc., coughs, asthma, rheumatism, neuralgia, bruises, abrasions, sores, conjunctivitis, hemorrhoids, pains in dentition, dye, coloring, flavoring, slightly in medicine, owing to expense.

Allied Plants:

1. *Garde'nia glandiflo'ra*, *G. flo'rida* and *G. ra'dicans*. E. and S. Asia. The fruits used in medicine, but more largely for dyeing yellow.

14. ZINGIBERACEÆ. Ginger Family.

Zin-ji-be-ra'se-e. L. *Zingiber* + aceæ, fr. Gr. ζιγγίβερις, ginger. Herbs. Distinguished by being aromatic, with creeping rhizomes; leaves stalked, broad, sheathing, parallel veins from midrib. Perianth superior, irregular. Each whorl 3, stamens 6, in 2 whorls, outer whorl staminodial or absent; ovary 3-celled, inferior; fruit 1–3-celled, capsule or berry; seeds many, arillate; tropics; stimulant; aromatic, stomachic (resin + vol. oil), starch, food.

Genera: 1. **Elettaria.** 2. **Zingiber.**

CARDAMOMUM. CARDAMOM.

Elettaria repens, (*Sonnerat*) *Baillon.*
(**E. Cardamomum,** *Maton.*) } The fruit.

Habitat. Malabar, cultivated. India, Mountains, 750–1500 M. (2500–5000°) elevation.

Syn. Malabar, Ceylon or Bastard Cardamom. Br. Cardamomi Semina, Cardamomum (Minus) Malabari(am)-cum. Fr. Cardamomes, Petit Cardamome. Ger. Fructus (Semen) Cardamomi (Minoris), Malabarische Kardamomen, Kleine Cardamomen.

El-et-ta'ri-a. L. fr. *Elettari;* *i. e.*, native name of plant in Malabar.

Re'pens. L. fr. *repo*, creep; *i. e.*, stem inclines to crawl on ground.

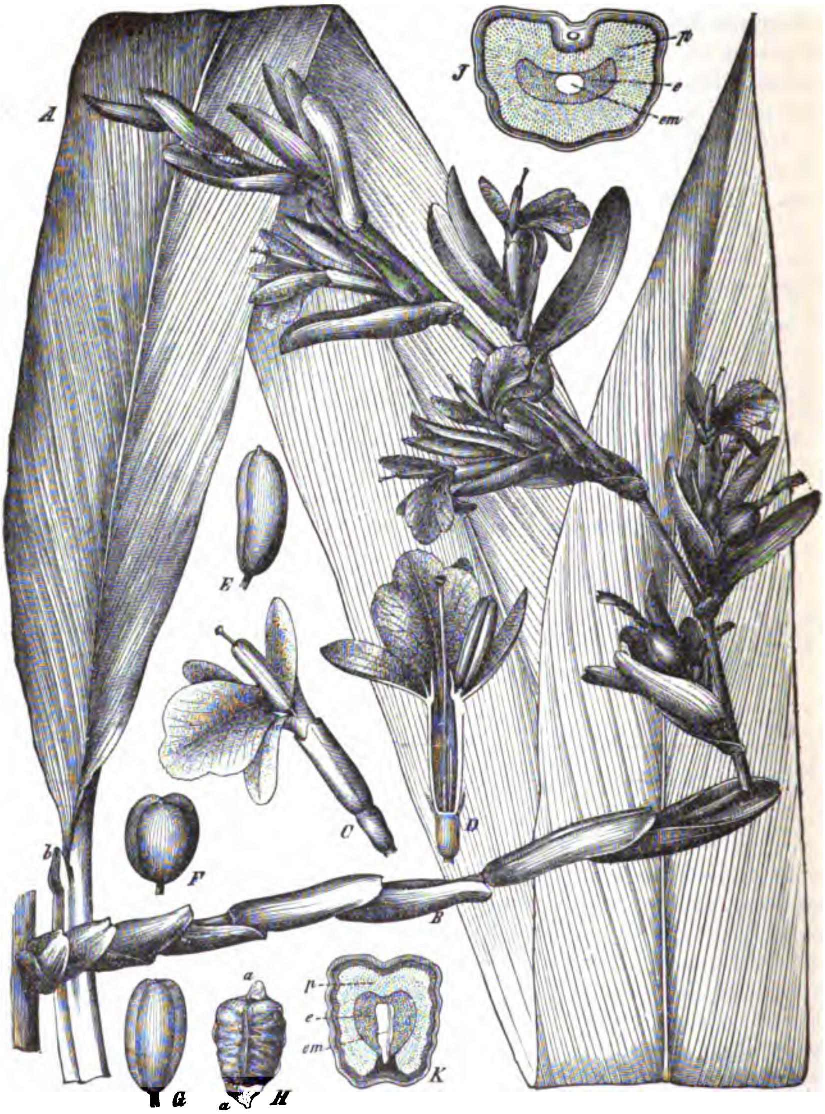
Car-da-mo'mum. L. fr. Gr. κάρδος, thistle, + ἄμωμος, blameless, classic name.

Plant.—Perennial herb; stems green, 2–4 M. (6–12°) high, tapering, shining, covered with leaf sheaths; leaves .3–.8 M. (1–2½°) long, 2.5–12.5 Cm. (1–5′) broad, lanceolate, flower stalk from stem base lies upon the ground; flowers greenish-white occurring in rainy season; rhizome tuberous, woody, fibrous roots below, scars above. Fruit, ovate, oblong, 12 Mm. (½′) long, 6 Mm. (¼′) thick, obtusely triangular, rounded at base, longitudinally striate, pale-buff color, 3-celled, pericarp leathery, placenta central; seeds about 20, brown, 5 Mm. (⅕′) long, 3 Mm. (⅛′) broad, angular, surrounded by a thin, membranous arillus; odor agreeable; taste aromatic, pungent. Seeds constitute 75 p. c. by weight, and keep best in pericarp, which (latter) should be rejected when for medicinal use. *Solvents:* diluted alcohol, boiling water. Dose, gr. 5–15 (.3–1 Gm.).

Adulterations.—With various varieties, also with orange seeds, green coffee, etc.; powdered with starch, sodium carbonate, etc.

Commercial.—Plants grow on spaces cleared in mountain forests which afford shade, or on betel-nut plantations of W. Mysore, and yield the fourth year, continuing a number thereafter. Fruit-gathering begins Oct., lasting the dry weather of two to three months, and are dried in several ways; the entire scape may be cut, though it con-

FIG. 58.



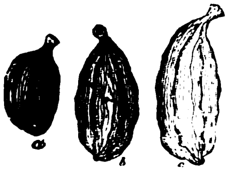
Elettaria repens; *A*, leaf with ligule, *b*; *B*, bracts; *C*, flower, natural size; *D*, flower, with calyx and corolla tube partially removed; *E*, *G*, capsule form; *H*, seed with arillus, *a*; *J*, cross-section of seed eight times enlarged; *K*, longitudinal section five times enlarged; *p*, perisperm; *em*, embryo; *e*, endosperm.

tains fruit of variable ripeness, or only ripe fruits are plucked, then dried by sun or fire, or scapes may be cut, carried to houses, cured several days, assorted and dried by fires. We have several varieties: 1. *Shorts*, 12 Mm. (½′) long, 6 Mm. (¼′) broad, plump, heavy. 2. *Short-longs* (medium), 18–25 Mm. (¾–1′) long, 6 Mm. (¼′) broad, paler buff, finer ribbed than shorts. 3. *Long* (*longs*), 25–31 Mm. (1–1¼′) long, 4 Mm. (⅙′) broad, rarely imported. The growing districts also furnish variety of names: 1. *Aleppo*, same as shorts, greenish tint. 2. *Malabar*, shorts and short-longs, best; shipped via Bombay. 3. *Madras*, usually short-longs, pale-buff, shipped via Madras, and Pondicherry. 4. *Mangalore*. The shorts of all varieties are best and more desired.

CONSTITUENTS.—Volatile oil 5 p. c., fixed oil 10 p. c., potassium salts 2½ p. c., starch 3 p. c., nitrogenous mucilage 1.8 p. c., yellow coloring matter 0.4 p. c., ligneous fibre 77.3 p. c., manganese 0.8 p. c., ash 6–15 p. c.

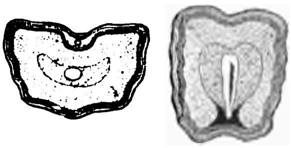
Volatile Oil.—Mostly in the testa; has odor and taste of the drug, somewhat camphoraceous, sp. gr. 0.900. Contains terpinene, $C_{10}H_{16}$, possibly dipentene, a body of the composition $C_{10}H_{18}O$ (terpineol ?), and acetic and formic acids. It is obtained by distillation or extraction with ether. The latter method gives more durable oil, but one mixed with fixed oil, it being soluble also in ether; this latter, however, can readily be separated. The distilled oil easily deteriorates by age.

FIG. 59.



Malabar cardamom; *a*, short; *b*, medium; *c*, long.

FIG. 60.



Cardamom seed; transverse and longitudinal section, magnified 5 diam.

PREPARATIONS.—1. *Tinctura Cardamomi.* Tincture of Cardamom. (Syn., Fr. Teinture de Cardamome; Ger. Kardamomentinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

2. *Tinctura Cardamomi Composita.* Compound Tincture of Cardamom. (Syn., Fr. Teinture de Cardamome Composée; Ger. Zusammengesetzte Kardamomentinktur.)

Manufacture: 2 p. c. Percolate cardamom 2 Gm., cassia cinnamon 2, caraway 1, cochineal .5, with diluted alcohol q. s. 95 Cc., then add glycerin 5, and mix well. Dose, ʒj–2 (4–8 Cc.).

3. *Extractum Colocynthidis Compositum,* 6 p. c. Dose, gr. 5–15 (.3–1 Gm.).

4. *Pulvis Aromaticus,* 15 p. c. Dose, gr. 10–30 (.6–2 Gm.).

5. *Tinctura Gentianæ Composita,* 1 p. c. Dose, ʒj–2 (4–8 Cc.).

6. *Tinctura Rhei,* 2 p. c. Dose, ʒss–4 (2–15 Cc.).

7. *Tinctura Rhei Dulcis*, 1 p. c. Dose, ʒij–4 (8–15 Cc.).

Unoff. Preps.: Infusion. Dose, ℥j–2 (30–60 Cc.). *Compound Infusion. Fluid Extract.*

PROPERTIES.—Carminative, stomachic, stimulant, aromatic, condiment.

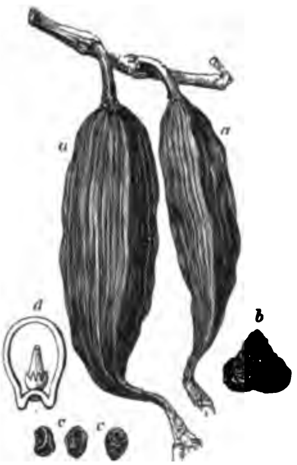
USES.—Adjuvant or corrective to cordials, tonics, purgatives, flavoring liquors, cakes, breath, etc.

Allied Plants:

1. *E. ma'jor*, *Ceylon Cardamom*, 40 Mm. (1⅗′) long, triangular, prolonged into a beak 15 Mm. (⅗′) long, brownish-gray color.

2. *Amo'mum Cardamo'mum*, *A. ve'rum* and *A. globo'sum*, *Round Cardamom.* Siam, Java, China; globular-ovate. *A. aroma'ticum*, *Bengal Cardamom*, 9-winged at apex. *A. xanthoi'des*, *Wild*, or *Bastard Cardamom*, *A. ma'ximum*, *Java Winged-Cardamom*, 9–12-winged from base to apex, and *A. Gra'num-paradi'si*, *Grain of Paradise.* Fruit resemble cardamom seeds, several varieties, used for ginger.

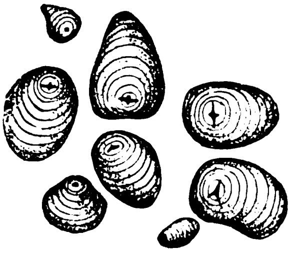
FIG. 61.



Ceylon cardamom; *a*, capsules; *b*, transverse section of capsule; *c*, seeds; *d*, section of seed with embryo; magnified.

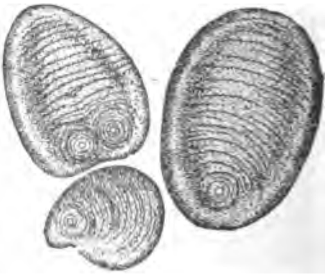
3. *Mara'nta arundina'cea*, *Arrow-root.*—The fecula of the rhizome official, 1820–1880. W. Indies, Bermudas, Brazil. Plant slender, 1–2 M. (3–6°) high, leaves 7.5–12.5 Cm. (3–5′) long, lanceolate, flowers white, rhizome perennial, tuberous, fleshy, scaly, 15–30 Cm. (6–12′) long. Arrow root in powder or lumps 4 Mm. (⅙′) thick, white, opaque, under microscope consists of oval granules of fine-lined layers, nucleus at broad end. The rhizome when one to two years old is dug, washed, deprived of scales, ground under water, kneaded, strained, and the solution allowed to subside. Root contains starch 27 p. c., fat 0.2 p. c. Used as demulcent, nutritive food for infants, convalescents, bowel or urinary troubles; in 5 p. c. solution with

FIG. 62.



Maranta starch.

FIG. 63.



Canna starch.

water or milk by boiling and flavoring with vanilla, lemon juice, etc.; also used in puddings. The jelly is more tenacious than all other starches, except Canna.

4. *Ca'nna e'dulis, Canna* (*Tous-les-mois*).—The fecula of rhizome official, 1870–1880. Peru, Brazil. Perennial herb 2.5 M. (8°) high; stem green; leaves parallel-veined, bluish-green; flowers few, in pairs, red; yellow, purple bract; fruit round capsule, 12 Mm. (½′) thick; rhizome creeping, fleshy, thick joints. Canna starch white powder, satiny, granules largest of all, potato coming next, $\frac{1}{8}$–$\frac{1}{12}$ Mm. ($\frac{1}{200}$–$\frac{1}{300}$′) long, flat, ovate, hilum at narrow end, encircled by many unequally distant rings. Grind rhizome under water, knead, strain, allow to subside. Used as demulcent, nutritive food for urinary and bowel troubles, infants, invalids in convalescence.

ZINGIBER. GINGER.

Zingiber Zingiber, (*Linné*) *Rusby.* } The rhizome.
(Z. officinale, *Roscoe.*)

Habitat. India, Hindostan (cultivated in W. Indies, Africa).

Syn. Black, African or Race Ginger. Fr. Gingembre (gris et blanc). Ger. Rhizoma (Radix) Zingiberis, Ingwer.

Zin'gi-ber. L. fr. Skt. *gringavera—gringa*, horn, + *vera*, body, horn-shaped; *i. e.*, shape of roots, Ar., Pers. *zanjabil, zenjebil*, Eng. *ginger*.

Of-fi-ci-na'le. L. *officina*, workshop; *opus*, work, + *facere*, to do; *i. e.*, used in the shop or store.

PLANT.—Perennial herb; stem barren, leafy, 1–1.3 M. (3–4°) high, entirely covered with the leaf-sheaths, solid, round; leaves 15–30 Cm. (6–12′) long, 2.5–4 Cm. (1–1½′) wide; flowering stalk from stem 15–30 Cm. (6–12′) long, terminating in a spike; flowers dingy yellow, 2–3 at a time. RHIZOME, 5–10 Cm. (2–4′) long, 12 Mm. (½′) broad, 4–8 Mm. (⅙–⅓′) thick, flattish, on one side lobed or clavately branched, deprived of corky, epidermal layer, buff-colored, striate, fracture mealy, fibrous, showing many small, scattered resin-cells and fibro-vascular bundles, the latter enclosed by a nucleus sheath; agreeably aromatic; taste pungent, warm. *Solvents:* alcohol or ether; boiling water partially. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—Rhizome with fibrous, light, friable, worm-eaten pieces (all to be rejected). Powder with rice starch, brick-dust, chalk, capsicum, mustard, and partially or wholly exhausted ginger.

Commercial.—Rhizomes are dug after stems have withered, January, February, when one or more years old, cleaned, washed in boiling water to prevent germination, then rapidly dried, and as such constitute *black, coated, unscraped ginger* in contradistinction to the further prepared *white, uncoated, scraped, race, hard ginger.* May bleach artificially by sulphur fumes, chlorinated lime, milk of lime, gypsum. We have several commercial varieties named after habitat:

1. *Jamaica.*—Official, deprived of epidermis, sometimes steeped in milk of lime, and covered with calcium carbonate, thus preventing insect attacks. Reaches us via England or direct from W. Indies.

2. *African.*—This is, as originally dried, covered with light-brown

suberous tissue, rhizome shorter than official, lobes broadly linear or oblong; yields 8–10 p. c. oleoresin.

3. *E. India.*—Like African, or the edges may be coated and flat sides deprived of epidermis; reaches us via Calcutta; yields 8 p. c. oleoresin.

4. *Chinese, Cochin.*—Coated, rhizome shorter, lobes stumpy.

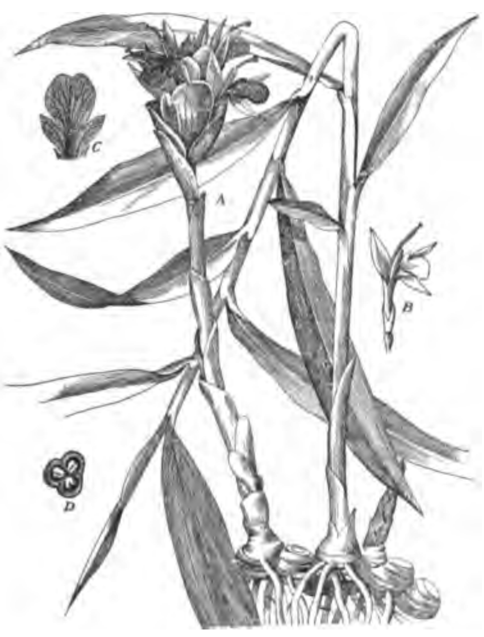
5. *Green.*—Lobed branches recently dug and marketed without drying.

6. *Preserved.*—Fresh rhizome steeped in hot syrup; it is soft, brown, yellow, translucent.

CONSTITUENTS.—Volatile oil 1–2 p. c., Gingerol, Resin, starch 20 p. c., mucilage, ash 4 p. c.

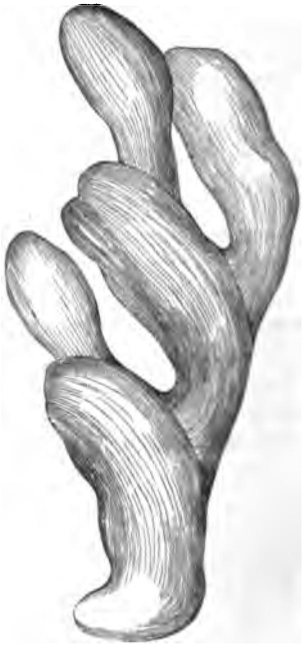
Volatile Oil.—Mostly $C_{10}H_{16}$, camphene and phellandrene; gives the peculiar flavor, pale-yellow, ginger odor, aromatic, burning taste, sp. gr. 0.885.

FIG. 64.



Zingiber; *A*, entire plant (½ nat. size); *B*, flower; *C*, labellum; *D*, transverse section of ovary.

FIG. 65.



Jamaica ginger; uncoated.

Gingerol.—Not a glucoside but a straw-colored, viscid, inodorous, pungent liquid, to which the hot taste is due; soluble in fat, volatile oil, alcohol, ether, slightly in benzin.

Resin.—Yields protocatechuic acid.

PREPARATIONS.—1. *Extractum Zingiberis Fluidum.* Fluid Extract of Ginger. (Syn., Fr. Extrait liquide de Gingembre; Ger. Flüssiges Ingwer-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–20 (.3–1.3 Cc.).

Prep.: 1. *Syrupus Zingiberis.* Syrup of Ginger. (Syn., Fr. Sirop de Gingembre; Ger. Ingwersirup.)

Manufacture: Fluid extract of ginger 3 Cc., precipitated calcium phosphate 1.5 Gm., sugar 85, water q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

2. *Oleoresina Zingiberis.* Oleoresin of Ginger. (Syn., Extractum Zingiberis Æthereum, Piperoid; Fr. Oléorésine (Piperoide) de Gingembre; Ger. Æstherisches Ingwer-Extrakt.)

Manufacture: Percolate 100 Gm. with ether until exhausted, recover ether; yield 5–6 p. c. Dose, ♏ss–2 (.03–.13 Cc.).

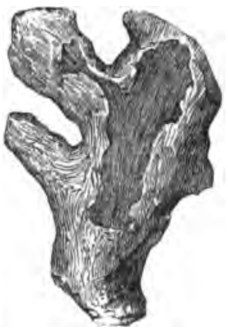
3. *Tinctura Zingiberis.* Tincture of Ginger. (Syn., Teinture de Gingembre; Ger. Ingwertinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol q. s. 100 Cc. Dose, ♏xx–60 (1.3–4 Cc.).

Prep.: 1. *Trochisci Zingiberis.* Troches of Ginger. (Syn., Fr. Tablettes (Pastilles) de Gingembre; Ger. Ingwerpastillen.)

Manufacture: Tincture of ginger 20 Cc., tragacanth 4 Gm., sugar 130, syrup of ginger q. s. 100 troches. Dose, 1–2 troches.

FIG. 66.



East India ginger; coated.

4. *Pulvis Aromaticus,* 35 p. c. Dose, gr. 10–30 (.6–2 Gm.).

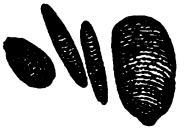
5. *Pulvis Rhei Compositus,* 10 p. c. Dose, ʒss–1 (2–4 Gm.).

Unoff. Prep.: Infusion. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Like other aromatics, carminative, stimulant, sternutatory, rubefacient, anodyne, sialagogue. This was introduced from Asia, through Arabia into Greece and Europe. The Arabian and Greek physicians used it as a condiment, carminative, stimulant, aphrodisiac.

USES.—Atonic dyspepsia, flatulent colic, atonic gout, diarrhœa, cholera, chronic bronchitis, corrective to nauseous medicines. Externally: colic, rheumatism, neuralgia, toothache, headache; in cataplasms, fomentations. The infusion for relaxed uvula, masticated for paralysis of tongue.

FIG. 67.



Ginger starch granules, magnified 250 diam.

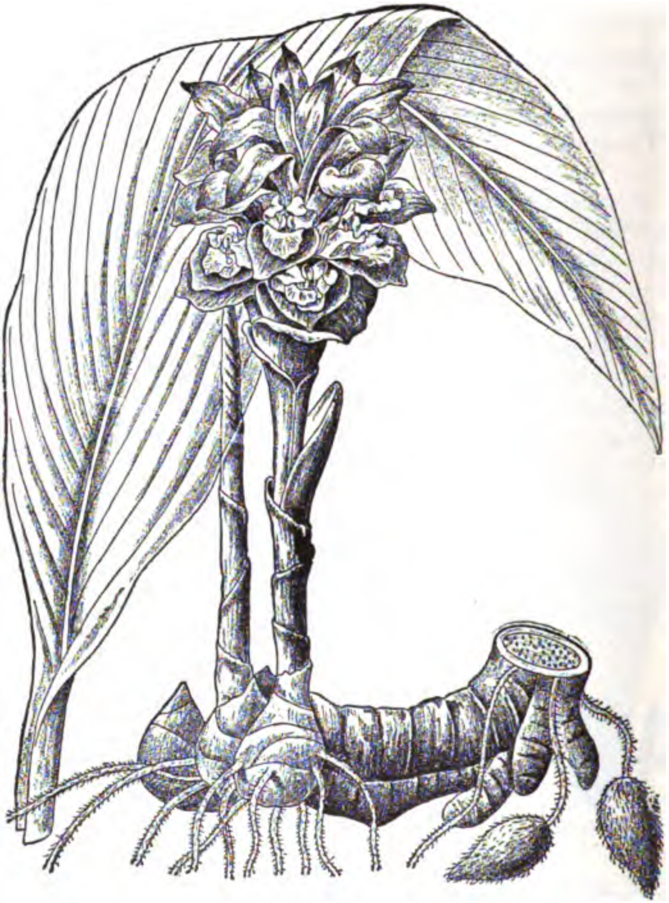
Allied Plants:

1. *Z. Zeru'mbet.*—Java (rhizome fleshy, spongy, ginger odor and taste), and *Z. Cassumu'nar.* India (root 5 Cm.; 2′ long, fleshy radicles, white tubers, scaly, brown; odor and taste camphoraceous).

2. *Cu'rcuma lo'nga, Turmeric.*—The rhizome official, 1820–1880. S. Asia, Indian Ocean Islands. Plant is a perennial; leaves radical, 1 M. (3°) long, lanceolate; flower-scape short, spike 15 Cm. (6′) long, flowers orange-yellow, in pairs; rhizome 2.5–5 Cm. (1–2′) long, 12 Mm. (½′) thick (long turmeric) to 18–25 Mm. (¾–1′) thick (round turmeric), sometimes in sections, yellowish-gray, annulate, inside orange-yellow, fracture resinous; odor ginger-like; taste warm, aro-

matic. Powder deep-yellow, brownish-red by alkalies or borax. Have several varieties: 1. Chinese (best). 2. Bengal. 3. Madras. 4. Java. 5. Cochin-China. Contains volatile oil 1 p. c., viscid oil 11 p. c., pungent resin, curcumin (coloring matter) 0.3 p. c. Used as stimulant, tonic, aromatic, condiment, for jaundice, and as ginger. Tincture, 15 p. c. (diluted alcohol) for coloring ointments, solutions, etc.

FIG. 68.

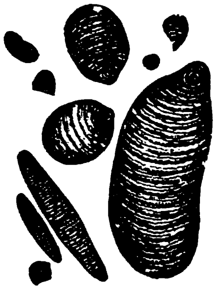


Turmeric rhizome and stem.

3. *C. Zedoa'ria, Zedoary.*—India. Rhizome (tuber) occurs as *long* and *round*, varying in size, 12–37.5 Mm. (½–1½′) long, usually met with in circular disks, 12–37.5 Mm. (½–1½′) broad, 4–16 Mm. (⅙–⅔′) thick; it is orange-brown, internally pale, reddish-gray-brown, with many brownish resin cells and lighter colored wood-bundles; fracture short, mealy; odor and taste ginger-like. Contains volatile oil ½–1 p. c., resin (to which pungent taste is due), starch, mucilage. Uses similar to ginger, but less effective. Dose, gr. 10–30 (.6–2 Gm.).

4. *Alpi'nia officina'rum, Galanga* (*Galangal*).—China. Rhizome cylindrical, branched, 5 Cm. (2′) long, 15 Mm. (⅝′) thick, annulate from leaf sheaths, rust-brown, fracture short, fibrous, inside yellowish, with many brownish resin cells, scattered wood bundles; odor and taste ginger-like. Contains volatile oil ½ p. c., resin, fat, galangol, galangin, starch. Used like ginger in same dose.

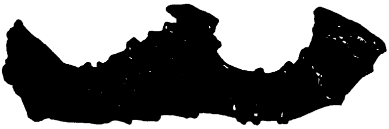
FIG. 69.



Curcuma starch.

5. *Al'etris farino'sa, Colic Root* (*Starwort*).—Rhizome official, 1820–1870. United States. Perennial .6–1 M. (2–3°) high; leaves radical, star-shaped, 7.5–10 Cm. (3–4′) long, 2.5 Cm. (1′) wide; flowers white, as though dusted with meal; rhizome 2.5 Cm. (1′) long, 3 Mm. (⅛′) thick, upper side flattened, root whitish, taste amylaceous, bitter; contains starch, bitter principle. Used as tonic, emetic, purgative for colic, dropsy, chronic rheumatism; in fluid extract, decoction, tincture. Dose, gr. 5–10 (.3–.6 Gm.).

FIG. 70.



Galanga.

15. ORCHIDACEÆ. Orchid Family.

Or-ki-da'se-e. L. *Orchi*(*s*)*d* + aceæ, fr. Gr. *ὄρχις*, a testicle, ancient name from shape of roots. Herbs or shrubs, terrestrial or epiphytical. Distinguished by flowers being perfect, irregular, reptile shape, perianth 6, in 2 whorls, petaloid, superior; leaves sheathing, entire; anthers 1–2, sessile, united to style (gynandrous); pollen cohering in masses; ovary 1-celled, inferior, long, 3-angled; capsule 3-valved; universal; aromatic, antispasmodic, nutrient, aphrodisiac, flavoring, beautiful flowers.

Genera: 1. **Cypripedium.** 2. **Vanilla.**

CYPRIPEDIUM. CYPRIPEDIUM (LADIES' SLIPPER).

Cypripedium { **hirsutum (pubescens)**, *Miller.*
parviflorum, *Salisbury.* } The rhizome and roots.

Habitat. N. America (Can., U. S. to N. Ca.), in woods and swampy places.

Syn. Yellow Ladies' Slipper, Indian or Venus Shoe, Slipper, Umbil, or Nerve Root, Venus Cup, Moccasin Plant or Flower, Monkey Flower, Yellows, Bleeding Heart, Umble, Yellow Umbel or Noah's Ark, American Valerian, Male Nervine, Rhizoma Cypripedii. Fr. Racine de Cypripède jaune, Valériane Américaine. Ger. Gelbfrauenschuhwurzel.

Cyp-ri-pe'di-um. L. *Cypris*, Venus, + *pes, pedis*, foot, Gr. Κύπρις, Venus, + *ποδός*, foot, *πόδιον*, a slipper; *i. e.*, the slipper-like form of flower's lip.

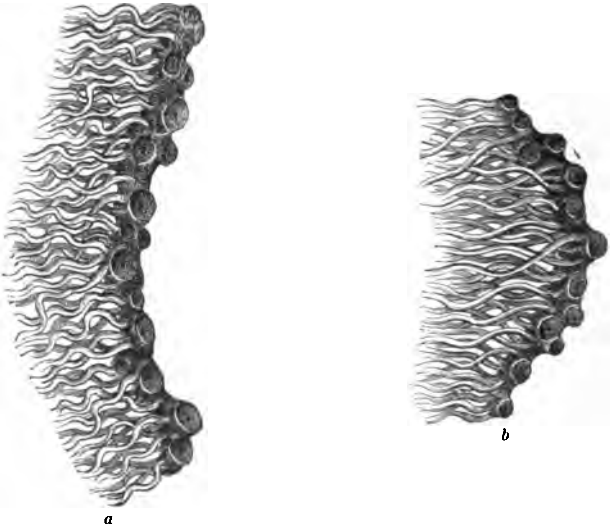
Hir-su'tum. L. *hirsutus*, rough, hairy, bristly; *i. e.*, stem, leaves and inside of corolla possess this property.

Pu-bes′cens. L. *pubescen*(*t*)*s*, downy, hairy; *i. e.*, stem, leaves and inside of corolla villous, hairy.

Par-vi-flo′rum. L. *parvus*, small, + *florus*, flower; *i. e.*, the flowers smaller than the preceding, which, in turn is usually called Large Yellow Ladies' Slipper.

PLANTS.—Herbaceous; stems .3–.6 M. (1–2°) high; leaves many-nerved, plaited, sheathing at base, acute, broadly ovate, 10–12.5 Cm. (4–5′) long, 5 Cm. (2′) wide; flowers May–June, beautiful yellow, solitary, 4-divided, shaped like Indian moccasin, lip 2.5–5 Cm. (1–2′) long. RHIZOME, horizontal, bent, 10 Cm. (4′) long, 3 Mm. (⅛′) thick, upper side beset with cup-shaped scars, under side covered closely with simple wavy roots 10–25 Cm. (4–10′) long, brittle, dark-brown, fracture short, white; odor peculiar, heavy; taste sweet, bitter, pungent.

FIG. 71.



a, Cypripedium hirsutum (pubescens), rhizome and roots, natural size; *b*, Cypripedium parviflorum, rhizome and roots, natural size.

C. parviflorum has shorter, thinner rhizome and orange-brown roots. The rhizome is collected shortly after flowering in the summer, washed, dried by sun and packed for market. *Solvents:* boiling water; diluted alcohol. Dose, gr. 15–30 (1–2 Gm.).

ADULTERATIONS.—*Hydrastis canadensis*, *Polygala Senega*, etc. All easily distinguishable by having finer roots, varying interior color, etc.

CONSTITUENTS.—Volatile oil, fixed oil, volatile acid, two resins, (tannin, starch, sugar, ash 6 p. c.).

The "Eclectics" prepare cypripedin, oleoresin, by precipitating concentrated alcoholic tincture with water; it is a mixed substance and does not deserve the name. Dose, gr. 1–2 (.06–.13 Gm.). The virtues possibly reside in the volatile oil and an unnamed bitter principle (glucoside).

PREPARATIONS.—1. *Extractum Cypripedii Fluidum.* Fluid Extract of Cypripedium. (Syn., Fr. Extrait liquide de Cypripède jaune; Ger. Flüssiges Gelbfrauenschuh-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

Unoff. Preps.: Extract. Dose, gr. 2–6 (.13–.4 Gm.). *Tincture,* 10 p. c. Dose, ʒj–2 (4–8 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Antispasmodic, diaphoretic, nervous stimulant.

USES.—Was popular with our aborigines and even at the present day as a substitute for valerian. Good in chorea, hysteria, epilepsy, nervousness, hypochondriasis, neuralgia, insomnia.

VANILLA. VANILLA.

Vanilla planifolia, *Andrews.* } The fruit.

Habitat. E. Mexico, hot, damp woods, forests; cultivated in tropics.

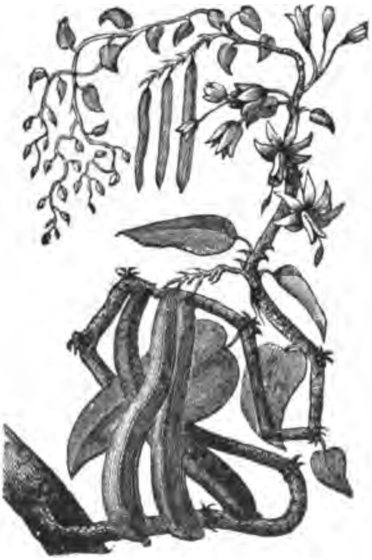
Syn. Vanilla Aromatica, Vaniglia. Fr. Vanille. Ger. Fructus (Siliqua) Vanillæ.

Va-nil'la. L. fr. Sp. *vainilla,* formerly *vaynilla,* dim. of *vaina* (*vayna*), scabbard, sheath, pod, lit. "little pod"; *i. e.,* pod resembling the sheath of a knife.

Plan-i-fo'li-a. L. *planus,* flat, + *folium,* leaf, flat leaved; *i. e.,* leaves plain or flat, without prominent veins.

PLANT.—Succulent, dark-green, epiphytic, perennial climber; stem long, smooth, much branched, nodes with aërial roots 12.5–15 Cm. (5–6′) long, for clinging to trees, frame-work, etc.; leaves 10–15 Cm. (4–6′) long, oval, tough, fleshy, veinless, dark-green, paler beneath; flowers 5 Cm. (2′) across, pale-yellowish-green, loose axillary racemes of 8–10. FRUIT, 15–25 Cm. (6–10′) long, 8 Mm. (⅓′) thick, linear, narrowed, bent or hooked at base, rather oblique at apex, wrinkled, warty, dark-brown, glossy, leathery, 1-celled, containing blackish-brown pulp, with many minute seeds and more or less acicular crystals; odor and taste peculiar, fragrant. *Solvent:* alcohol (75 p. c.). Dose, gr. 5–30 (.3–2 Gm.).

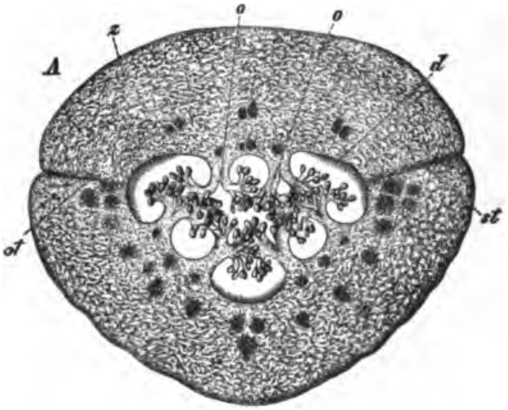
FIG. 72.



Vanilla planifolia.

Commercial.—Plant mostly cultivated from cuttings (sometimes seeds) in Papantla, Misantla, Vera Cruz and Oaxaca provinces, bears fruit the third year, and continues thereafter for thirty to forty; collect fruit in late autumn before quite ripe, as green begins disappearing into yellow, then dry and cure by sun or fire, which requires 3–4 months; when partly dried they are wrapped in blankets to produce sweating or fermentation, thereby the odorous principle (vanillin), after which the drying is completed, beans coated with oil (that which exudes, also cocoa and cashew nut), tied in small bundles, wrapped in foil, and marketed. There are several varieties: 1. *Mexican, Vera Cruz,* the best, but beans vary much in value. 2. *Bourbon,* from Isle of Réunion, resembles Mexican, but beans blacker, tapering portion shorter, less firm, surface smooth, waxy, and soon becomes coated with acicular crystals (frost); odor more like Tonka bean. 3. *Mauritius,* inferior Bourbon, from the Seychelles, pods only 15 Cm. (6′) long, 6 Mm. (¼′) wide, pale color, smooth, not waxy, faint odor. 4. *Venezuelan* (*V. guiane′nsis*), 10 Cm. (4′) long, rather thick, Tonka odor. 5. *Brazilian* (*V. Pompo′na*) called *Vanillons,* larger, thicker than Venezuelan, inferior vanilla odor (heliotrope), contains 0.5 p. c. vanillin. Some beans also come from Java, Honduras, Madagascar, Tahiti, Guadeloupe, etc.; others occur on the market having had the vanillin removed by a solvent, and others still to which benzoic acid has been added.

FIG. 73.



Vanilla fruit, cross section magnified; *z,* fruit flesh; *st,* opening suture; *o,* seed placentæ; *d,* papillæ.

CONSTITUENTS.—Vanillin (Mexican 1.7 p. c., Bourbon 2 p. c., Java 2.75 p. c., in the two last associated with odorous oil), fixed oil 11 p. c., resin, sugar, mucilage, ash 4–5 p. c.

Vanillin, $C_8H_8O_3$.—Obtained by softening the alcoholic extract with water, agitating with ether until color exhausted, evaporating, treating residue with boiling water, which deposits it in colorless needles of vanilla odor, pungent, warm taste, soluble in alcohol, ether, chloroform, water and carbon disulphide. In damp air oxidizes slowly to vanillic acid, $C_8H_8O_4$; combines with bases, and with ferric chloride gives blue or green; it is the aldehyde of methyl-protocatechuic acid, and is prepared artificially from coniferin ($C_{16}H_{22}O_8 + 2H_2O$, in the cambium of pines), carbolic acid, eugenol and guaiacol. Dose, gr. ⅙–⅓ (.01–.02 Gm.).

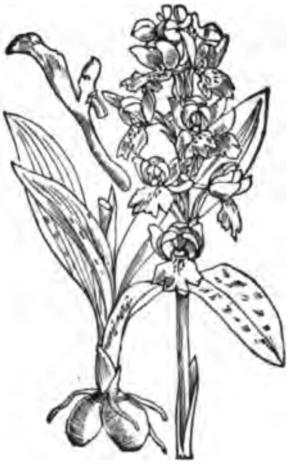
PREPARATIONS.—1. *Tinctura Vanillæ.* Tincture of Vanilla. (Syn., Fr. Teinture de Vanille; Ger. Vanille-tinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. + sugar 20, with alcohol 65 p. c., q. s. 100 Cc. For flavoring.

2. *Trochisci Ferri,* gr. ⅐ (.009 Gm.) in each troche. Dose, 1–2 troches.

Unoff. Prep.: Syrup. For flavoring.

FIG. 74.



Orchis mascula.

PROPERTIES. — Carminative, stimulant, aphrodisiac, antihysteric, irritant. Those working in it have itching hands, face; skin covered with pruriginous eruptions, dizziness, weariness, muscular pains; eruptions due to an *acarus* which does not enter the skin.

USES.—The Spanish conquerors found vanilla being used in Mexico for flavoring chocolate, etc., and while now recommended for hysteria, it is chiefly employed as a flavoring agent, being the most general of all substances; large quantities sometimes produce poisonous symptoms.

Allied Plants:

1. *V. Pompo'na,* Guadeloupe variety, *V. Gardne'ri,* Brazilian and Bahia, *V. odora'ta, V. phæa'ntha,* Jamaica, Trinidad.

2. *O'rchis ma'scula* and other species, *Salep.* The fecula of the root, official, 1820–1830. C. and S. Europe; rich woods. Small herb 15–45 Cm. (6–18′) high, leaves parallel-veined, sheathing; flowers pinkish, showy, nectariferous spur underneath; root (tubers) consists of two fleshy tubers 2.5 Cm. (1′) long, deprived of epidermis by scalding in water. Yellowish-brown, hard, translucent, horny, insipid. Contains starch 27 p. c., mucilage 48 p. c. Starch obtained by grinding root under water, straining, subsiding. Used as demulcent, nutritive diet for infants, children, chronic diarrhœa, cholera infantum, tuberculous diarrhœa, in mucilage (1 part + water 50). Dose, *ad libitum.*

ADULTERATIONS.—Tubers with colchicum corm, this latter being recognized by its side groove and sweet, bitter, acrid taste; powder with starch, flour, which can be readily distinguished by microscope.

SUB-CLASS: **DICOTYLEDONES (Embryo with two cotyledons, stem exogenous (with pith, wood, bark), leaves net-veined).**

SERIES 1: **CHORIPETALÆ. Petals separate and distinct, or wanting.**

16. PIPERACEÆ. Pepper Family.

Pip-e-ra'se-e. L. *Piper* + aceæ, Gr. πίπερι, Skt. *pipala,* Bengalese, *pippul,* fr. Gr. πέπτω, to digest; *i. e.,* it aids digestion. Herbs or shrubs. Distinguished by jointed stems; leaves entire; flowers perfect, without floral envelopes, spikes; ovary 3–5, somewhat united, 1-celled; ovule 1, stigma 2–4; fruit somewhat fleshy, 1-celled, 1-seeded; tropics; acrid, pungent, aromatic, stimulant (volatile oil + resin).

Genera: 1. **Cubeba.** 2. **Piper.**

CUBEBA. CUBEB.

Cubeba Cubeba, (*Linné filius*) *Lyons.* }
(**Piper Cubeba,** *Linné filius.*) } The unripe fruit.

Habitat. Java, Sumatra, Borneo; cultivated in two former islands, and in W. Indies, Ceylon.

Syn. Tailed Cubebs, Tailed Pepper, Java Pepper, Fructus (Baccæ) Cubebæ, Piper Caudatum, Cubebs. Fr. Cubébe, Cubébe poivre à Queue. Ger. Kubeben.

Cu-be′ba. L. fr. Gr. *κουβέβα*, of Actuarius; name used since the 10th century. Pers. *kababa*, their native name of the plant.

Pi′per. L. see etymology, page 133, of Piperaceæ.

Plant.—Climbing perennial; stem jointed, flexuous, 6 M. (20°) high; leaves 15 Cm. (6′) long, lanceolate, leathery, shining, nerved, petiolate, flowers diœcious, spikes. Fruit, 4 Mm. (⅛′) thick, globular, contracted at base into a rounded stipe (not a true pedicel, but stigma remnants), 6 Mm. (¼′) long, reticulately wrinkled, blackish-gray; mesocarp with many oil cells; internally whitish, 1 undeveloped seed, hollow; odor strong, spicy; taste aromatic, pungent. *Solvents:* ether; alcohol. Dose, gr. 15–60 (1–4 Gm.).

Adulterations.—Cubeb rachis or stalks (inodorous), black pepper and other Piperaceæ fruits. *Rhamnus cathartica* fruit (pedicellate and contains 4 seeds), allspice (much larger, 2-seeded, no pedicel). *Juniper communis* fruit (much larger, different taste). Powdered cubeb deteriorates unless kept in tight containers, hence best to powder only when needed, sometimes mixed with powdered allspice, flour and starch.

Commercial.—Cubeb grows extensively in coffee plantations or on grounds reserved for the purpose, being supported usually on shade trees; fruit is gathered when full grown, but before ripe, dried carefully in the sun and exported from Java to Singapore, whence it enters market.

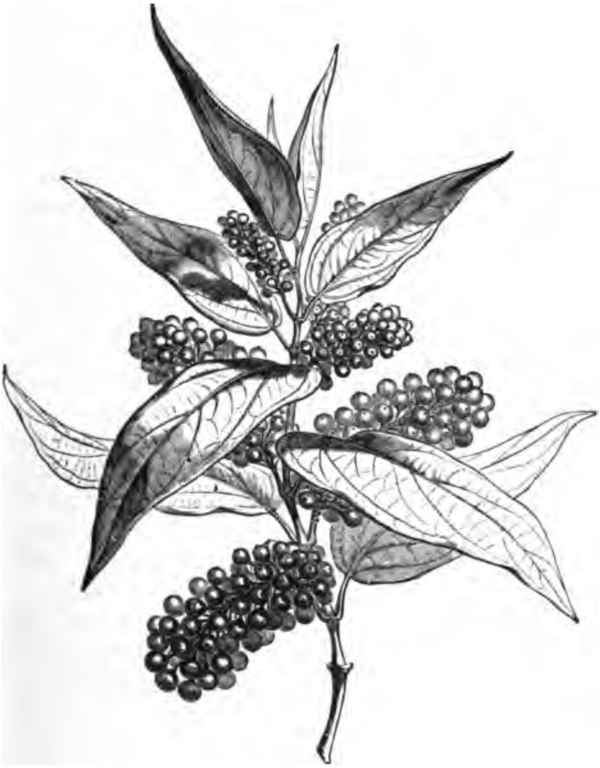
Constituents.—Volatile oil 5–15 p. c., Resin 3 p. c., Cubebin ½–2½ p. c., Cubebic acid 1–3½ p. c., fat, wax, starch, ash 5–6 p. c.

Oleum Cubebæ. Oil of Cubeb, *official.*—(Syn., Oleum Cubebarum, Oil of Cubebs; Fr. Essence de Cubèbe; Ger. Kubebenöl.)

This volatile oil, obtained from cubeb by distilling with water or steam, is a yellowish-green liquid, characteristic odor, warm, camphoraceous, aromatic taste, sp. gr. 0.920, soluble in equal volume of alcohol; contains a little dipentene, $C_{10}H_{16}$, but mostly sesquiterpene, cadinene, $C_{15}H_{24}$. If old, or distilled from old fruit it then has additionally an inodorous stearopten, cubeb camphor, $C_{15}H_{24}.H_2O$, which soon deposits. *Test:* Oil + sulphuric acid turns yellow, when warmed red; dissolves iodine quietly. Dose, ♏v–20 (.3–1.3 Cc.).

Resin.—Extracted by ether which also takes up volatile oil, fixed oil, cubebin, chlorophyll and wax; evaporate off volatile oil, when cold cubebin and wax deposit; decant from these, separate fat and have left the resin, which is amorphous, soluble in alkalies, alcohol, not precipitated by alcoholic solution of lead acetate.

FIG. 75.

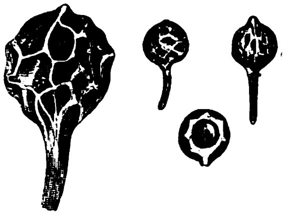


Cubeba (Piper) Cubeba.

Cubebin, $C_{10}H_{10}O_3$.—This constitutes the precipitate from oleoresin upon standing; it is white, crystalline, inodorous, inert; alcoholic solution bitter.

Cubebic Acid, $C_{14}H_{16}O_4$.—Brownish, resin-like mass, soluble in alkalies, alcohol, ether, chloroform, precipitated by lead acetate; diuretic. Dose, gr. 5–10 (.3–.6 Gm.). Last three are red with sulphuric acid.

FIG. 76.



Cubeb; fruit, natural size, and magnified.

PREPARATIONS.—1. *Extractum Cubebæ Fluidum.* Fluid Extract of Cubeb. (Syn., Fr. Extrait liquide de Cubèbe; Ger. Flüssiges Kubeben (Cubeben) Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

2. *Oleoresina Cubebæ.* Oleoresin of Cubeb. (Syn., Extractum Cubebæ Æthereum; Fr. Oléorésine de Cubébe; Ger. Extractum Cubebarum (Ætherisches), Kubebenextrakt.)

Manufacture: Percolate 100 Gm. with ether until exhausted, recover ether; after standing deposits wax and cubebin, both of which should be rejected; yield 18–22 p. c. Dose ♏v–30 (.3–2 Cc.).

Prep. 1. *Trochisci Cubebæ.* Troches of Cubeb. (Syn., Fr. Pastilles de Cubèbe; Ger. Kubebenpastillen.)

Manufacture: Oleoresin of cubeb 4 Gm., oil of sassafras 1, extract of glycyrrhiza 25, acacia 12, syrup of tolu q. s. 100 troches. Dose, 1–5 troches.

3. *Tinctura Cubebæ.* Tincture of Cubeb. (Syn., Fr. Teinture de Cubèbe; Ger. Kubebentinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Extract. Dose, gr. 2–10 (.13–.6 Gm.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Diuretic (resin + cubebic acid), stimulant, carminative, expectorant, disinfectant, local irritant (volatile oil), may cause headache, giddiness, nausea, purging, paralysis; it is eliminated by bronchial mucous membrane, skin and kidneys, all being stimulated and the increased secretions disinfected; imparts to urine a peculiar odor.

USES.—Gonorrhœa, urethritis, vesical irritability, cystitis, abscess of prostate gland, piles, chronic bronchitis, catarrh. Arabians used it similarly to black pepper, and were the first to introduce it into Europe.

Allied Plants:

1. *C. Lo'wong* (*Piper Lowong*) and *C. Walli'chii* (*P. ribeso'ides*).—Fruit of both much like the official.

2. *C. cani'na* (*P. caninum*) (fruit smaller than official, contracted below into a stalk half the length of the globular portion) and *C. cra'ssipes* (*P. crassipes*) (fruit larger than the official).

3. *False Cubebs.*—Origin unknown, fruit wrinkled, brownish-gray, size of the official, stalk 5 Mm. ($\frac{1}{5}'$) long, odor mace-like.

PIPER. PEPPER (BLACK PEPPER).

Piper nigrum, *Linné.* } The unripe fruit.

Habitat. S. India, Malabar Coast, Philippine Islands, Sumatra, Java, Singapore, Ceylon, Penang, Luzon, Borneo, Malacca, Siam, W. Indies.

Syn. Pepper Corn, Pepper Vine, African Black Pepper, Cubeb Pepper. Fr. Poivre noir (commun); Ger. Schwarzer Pfeffer.

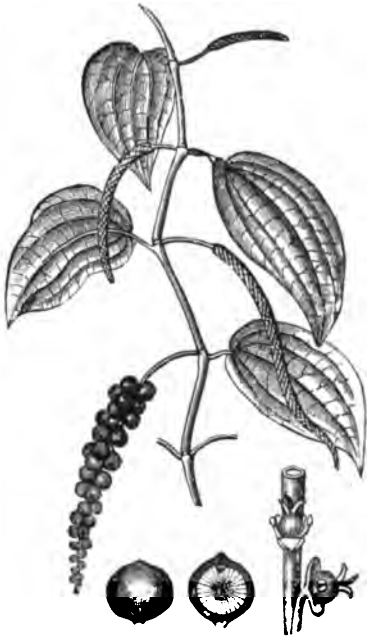
Ni'grum. L. *niger*, black, fr. *nec*, to die, as seen in Gr. νεκρός, dead, *nox*, night; *i. e.*, color of the brownish-black fruit when compared with other varieties.

PLANT.—Perennial trailing or climbing vine; stem 6–9 M. (20–30°) long, articulated, smooth, woody, joints thickened, from which adventitious rootlets arise for adhering to support or taking root in the soil; leaves 10–15 Cm. (4–6′) long, ovate, petioles 12 Mm. (½′) long, acute at base and apex, entire, smooth, leathery, dark-green, 5–7-nerved, flowers whitish, unisexual, sessile, elongated spikes. FRUIT, berry-like, sessile, green, then red, when ripe yellow, globular, 4 Mm. (⅙′) thick, reticulately wrinkled, brownish-black, inside lighter, hollow, 1 seed with an undeveloped embryo; odor aromatic; taste pungently spicy. *Solvents:* ether; alcohol; water partially. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—With fruits of allied species; powdered pepper with starches, mustard, husks, flaxseed, capsicum, all recognized by microscope. Rice starch and the starch in pepper have same shape, but quantity present will aid detection.

Commercial.—Our supply comes from Singapore, Sumatra, and Java, where the plants are propagated by cuttings and trained to run upon support of trees planted for the purpose, hence name pepper vine. When the basal fruits begin changing from green to red the whole spike is gathered; if allowed to remain on until ripe they are less pungent and fall off easily. Vines yield 8–10 lbs. (3.5–4.5 Kg.) annually, begin bearing when 2–4 years old, and decline after fifteenth year. The day after gathering, the spikes are deprived of fruit, this latter is then cleaned of stalks by picking, rubbing, etc., and dried by sun or fire. There are several varieties: 1. *Malabar* (heaviest). 2. *Cochin*. 3. *Penang* (strongest). 4. *Singapore* (darkest). 5. *Siam*. These are often sold mixed, the weight as a rule governing quality.

FIG. 77.



Piper nigrum.

CONSTITUENTS.—Piperin 6–8 p. c., Volatile oil 1–2 p. c., Piperidine 0.56 p. c., Chavicin, fat 7 p. c., starch, proteids 12 p. c., ash 5 p. c.

Piperinum. Piperin, $C_{17}H_{19}NO_3$, *official.*—This neutral principle is obtained from pepper and other Piperaceæ plants by treating alcoholic extract with potassa solution which dissolves resin and forms soap of fat. Wash residue with cold water, filter, treat residue on filter repeatedly with alcohol from which piperin crystallizes. It is in pale-yellowish prismatic crystals, odorless, sharp biting taste, soluble in 30 parts alcohol, no residue. *Tests:* 1. With sulphuric acid get blood-red color, disappearing when diluted with water. 2. With nitric acid turns orange, then red, the acid becoming yellow then red; add to the solution potassa T. S., get yellow then blood-red. 3. Alcoholic solution of alkalies decompose it into piperic acid, $C_{12}H_{10}O_4$, and piperidine, the former oxidizing with potassium permanganate into piperonal, $C_8H_6O_8$, crystals (artificial heliotropin). Dose, febrifuge, gr. 1–5 (.06–.3 Gm.).

Volatile Oil, $C_{10}H_{16}$.—Obtained by distillation with water or steam, is colorless, non-pungent, sp. gr. 0.864. Dose, ♏j–3 (.06–.2 Cc.). The commercial *oil of black pepper* is the volatile oil, fixed oil, and pungent resin, being a by-product in making piperin, consequently is very similar to the oleoresin.

Piperidine, $C_5H_{11}N$.—Obtained by heating piperin with potash-lime; it is a colorless liquid alkaloid, ammoniacal, peppery odor, readily forms crystalline salts with acids (hydrochlorate, etc.).

Chavicin.—Obtained by neutralizing the potassa solution (for piperin) with an acid ; it is a soft, pungent resin upon which the pungency and medicinal virtues largely depend ; soluble in alkalies, alcohol, ether.

PREPARATIONS.—1. *Oleoresina Piperis.* Oleoresin of Pepper. (Syn., Extractum Piperis Fluidum. Fluid Extract of Black Pepper. Fr. Oléorésine de Poivre noir ; Ger. Ætherisches Pfefferextrakt.)

Manufacture: Percolate 100 Gm. with ether until exhausted, recover ether ; yield 5–6.5 p. c. Dose, ♏ss–2 (.03–.13 Cc.).

This is a mixture of volatile and fixed oil, holding the pungent resin and piperin in solution ; the latter precipitates somewhat on standing, and should be rejected.

Unoff. Preps.: Fluid Extract. Dose, ♏v–20 (.3–1.3 Cc.). *Plaster* (oleoresin gr. 1 (.06 Gm.) to every 4 square inches + resin plaster q. s.). *Confection. Poultice.*

PROPERTIES.—Stimulant, tonic, febrifuge, irritant, rubefacient, carminative, antipyretic. From Hippocrates' time down as a condiment, stimulates secretion of mouth, stomach, kidneys ; excessive doses give abdominal heat, thirst, vomiting, fever, convulsions, increases urine, irritates bladder, urethra, and may cause urticaria.

USES.—Intermittents, enlarged lymphatic glands, gargles to stimulate throat, gums, plasters for muscular rheumatism, headache, colic, also for flatulence, indigestion, headlice, gleet, leucorrhœa, gonorrhœa, fistula, paralysis of tongue. Next to salt the greatest condiment the world over.

Allied Plants:

1. *P. officina'rum (lo'ngum), Long Pepper.*—The immature fruit dried in the sun, official, 1830–1840. Java, India, Ceylon, Philippine Islands, Bengal. Shrub like official ; leaves cordate ; flowers spikes ; fruit spike-like cone 2.5–4 Cm. (1–1½′) long, 5 Mm. (⅕′) thick, cylindrical, uneven, dusty, blackish-gray, the many coalesced fruits spirally arranged, each crowned with style remnant ; odor, taste, properties and composition like official. The Bengal long pepper is darker, and shorter (2.5 Cm. ; 1′ long) than that from elsewhere.

2. *P. a'lbum, White Pepper.*—From ripe fruits of *P. nigrum*, by gathering spike when fruits fully matured, cleaning same, immersing

in water and depriving of epicarp and sarcocarp by rubbing with the hands in baskets; are somewhat larger than official, smooth, yellowish, hard, horny, mealy within; taste and odor similar to but less powerful than the black. Have four varieties: 1. Tellicherry. 2. Penang. 3. Batavia. 4. Singapore. Much used in China. A spurious variety is made by soaking off (or using mechanical means) the outer portion of black pepper (pericarp), or simply drying the very young and immature fruits; this is smaller and inferior.

MATICO. MATICO.

Piper angustifolium, *Ruiz et Pavon.* } The leaves.

Habitat. Tropical America, Peru, Mexico, Venezuela, Brazil, Cuba. Cultivated.

Syn. West Indian Matico, Pepper Elder, Soldier's Herb. Br. Maticæ Folia. Fr. Feuilles de Matico. Ger. Maticoblätter.

An-gus-ti-fo′li-um. L. *angustus*, narrow, + *folium*, a leaf; *i. e.*, has narrow leaves.

Ma-ti′co. A Spanish soldier named Matico, being wounded, dragged himself toward some of these green plants, which, when applied, stopped the bleeding; also called in Spanish, *yerba soldado* or *palo-del-soldado*, soldier's herb or tree.

PLANT.—Shrub with stem 3 M. (10°) high, having enlarged joints and branches quadrangular, younger ones hairy; flowers minute, yellowish, dense, on slender spike, 10–17.5 Cm. (4–7′) long; fruit size of poppy seed, hard, black, 1-seeded. LEAVES, 10–15 Cm. (4–6′) long, petiolate, oblong-lanceolate, apex pointed, base unequally heart-shaped, crenulate, tessellated above, reticulate beneath, meshes small, veins densely brownish-hairy; aromatic, spicy, bitterish. *Solvents:* boiling water; alcohol (50–75 p. c.). Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—Leaves of allied species and other S. American plants which are also called matico, as *Eupato′rium glutino′sum*, *Walthe′ria glomera′ta*, *Pi′per lanceæfo′lia*, and *P. adu′ncum*. All these have matico properties, but none are tessellated above or rough and hairy below.

CONSTITUENTS.—Volatile oil 1½–2¾ p. c., artanthic acid (crystalline), pungent resin, bitter principle, tannin, mucilage. The name maticin was given to a supposed bitter principle, which now proves to be only a potassium salt.

PREPARATIONS.—1. *Extractum Matico Fluidum.* Fluid Extract of Matico. (Syn., Fr. Extrait liquide de Matico; Ger. Flüssiges Matico-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

2. *Tinctura Matico.* Tincture of Matico. (Syn., Fr. Teinture de Matico; Ger. Maticotinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

Unoff. Prep.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

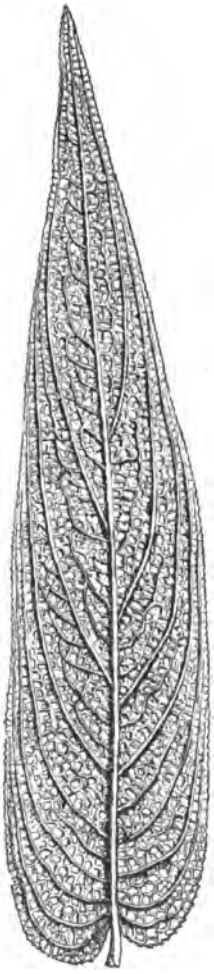
PROPERTIES.—Mostly due to the volatile oil; stimulant, tonic, styptic, vulnerary, diuretic, aphrodisiac, constricts capillaries, hence controls mucous fluxes, hemorrhages, resembles cubeb.

Uses.—Bronchitis, gonorrhœa, menorrhagia, hemorrhoids, diarrhœa, dysentery, hæmaturia, hemorrhage from lungs, stomach, kidneys, bowels, rectum, vesical catarrh, incontinence of urine; locally leaves to bleeding surfaces, owing to the many hairs promoting blood-clot.

Allied Plants:

1. *P. Be'tle.*—India. Climbing plant; leaves chewed by Malays with lime and areca-nut shavings. *P. Carpu'nya,* Chili, Peru. Small tree. *P. pelta'tum, P. umbella'tum.* Tropical America. Diuretic, skin diseases, tumors.

Fig. 78.



Matico; natural size.

2. *Methy'sticum Methysticum* (*Piper Methysticum*), *Ava* (*Kava-Kava*).—Sandwich Islands. The root of this is used as a stimulant, diuretic, diaphoretic, tonic, has lilac odor, pungent, bitter taste; contains acrid resin 2 p. c. volatile oil, kavahin, methysticin (resembles piperin); its infusion yields upon fermentation the beverage *kava;* also used natively for gonorrhœa, vesical and urethral troubles.

17. JUGLANDACEÆ. Walnut Family.

Ju-glan-da'se-e. L. *Juglans, Jugland* + aceæ, walnut tree, fr. *Jovis glans,* nut of Jove—Jupiter, referring to the fruit. Trees. Distinguished by alternate pinnately compound leaves, exstipulate; flowers monœcious—staminate in catkins, pistillate in spikes, the former with irregular, the latter with regular calyx, 3–5-lobed; ovary 2–4-celled, inferior; ovule 1; fruit (tryma) dry drupe with crustaceous or bony nut shell, containing 4-lobed seed; temperate climates; cathartic, timber; seed oily, edible.

Genus: **1. Juglans.**

JUGLANS. JUGLANS (Butternut).

Juglans cinerea, *Linné.* } The bark of the root collected in autumn.

Habitat. N. America (Canada, United States, Missouri to Arkansas), rich woods.

Syn. Oil Nut (Bark), Kisky Thomas Nut, White or Lemon Walnut. Fr. Écorce de Noyer gris. Ger. Graue Wallnussrinde.

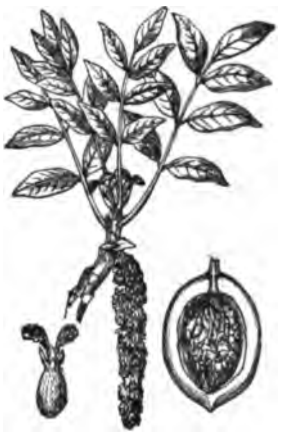
Jug'lans. L. classic name for the Walnut tree, *Juglans regia,* contraction from *Jovis, Jove, Jupiter* + *glans,* a nut or acorn = Jupiter's nut; *i. e.,* named by way of eminence.

Ci-ne're-a. L. *cinereus,* ash-colored, grayish; *i. e.,* the bark of young branches.

Plant.—Handsome tree, 9–15 M. (30–50°) high, trunk .6–1.3 M. (2–4°) thick; stem 3 M. (10°) above divides into branches, producing deliquescent appearance, bark of branches smooth, grayish ; leaves .3 M. (12′) long, imparipinnate; leaflets 5–9 pairs, sessile, oblong, 5–7.5 Cm. (2–3′) long, round base, acuminate, serrate, pubescent; flowers April–May, monœcious, staminate catkins, 7.5–12.5 Cm. (3–5′) long, pistillate 4–5 together, forming a spike, the germ surmounted by two large, feathery crimson stigmas; fruit September–October, large, drupe, oblong, 6 Cm. (2½′) long, hairy, viscid, when immature green, when ripe brown; epicarp formed from thickened perianth tube, endocarp from altered ovarian walls, hard, bony, united to rind, seed or kernel thick, oily, edible. BARK OF ROOT, in flat or curved pieces, 5 Mm. (⅕′) thick, dark-gray, smoothish, or deprived of soft cork and deep-brown, inside smooth, striate, transverse fracture short, delicately checkered whitish and brown; odor feeble; taste bitter, acrid. The liber or inner bark only is used, and should be collected May–June, or perferably autumn, when its inner surface is loosely shreddy with partly detached liber; if taken from plant in April it is sweetish, insipid, less active. *Solvents:* diluted alcohol; boiling water. Dose, ʒj–2 (4–8 Gm.).

Commercial.—If trees punctured just before the leaves appear a saccharine juice exudes yielding a sugar equal to sugar-maple. The wood is useful, as it is durable and never worm-eaten, although it is neither compact nor strong. The fruit when half grown may be pickled; when nearly ripe the rind is juicy, which colors skin and can be used for dyeing fabrics brown or black; when fully ripe the kernels become a desirable food, being so rich in oil (nut oil) as to replace meat. Upon removing outer bark the inner is white, but on exposure soon turns a lemon color, then deep-brown; it is so tough and fibrous as to be powdered with difficulty. Has been a medicine since Hippocrates' time for various troubles. During our Revolutionary and Civil wars soldiers used it extensively instead of rhubarb.

FIG. 79.



Juglans, flowering branch, cross section of fruit.

CONSTITUENTS.—Nucin, fixed oil 14 p. c.,(volatile oil, tannin, resin).

Nucin (Juglone, Juglandic Acid), $C_{10}H_6O_3$.—Occurs in orange-yellow needles, acrid, purple by alkalies, volatile with steam, decomposed by long boiling.

PREPARATIONS.—1. *Extractum Juglandis.* Extract of Juglans. (Syn., Extract of Butternut; Fr. Extrait d'Écorce de Noyer gris; Ger. Butternussrinden-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. Dose, gr. 5–20 (.3–1.3 Gm.).

Unoff. Preps.: Fluid Extract. Dose, ʒj–2 (4–8 Cc.). *Decoction.* Dose, ℥ss–1 (15–30 Cc.). *Spirit.* Dose, ʒss–1 (2–4 Cc.). Juglandin, "Eclectic's" resinoid, obtained by precipitating concentrated alcoholic tincture with water. Dose, gr. 3–10 (.2–.6 Gm.).

PROPERTIES.—Cathartic, tonic, rubefacient, resembles rhubarb in action, does not gripe.

USES.—Costiveness, dysentery, with calomel in intermittent and remittent fevers, for dyeing wool brown or black.

Allied Plants:

1. *J. re′gia, English Walnut.*—Persia, Himalaya, China, cultivated, Europe. Decoction of leaves used in leucorrhœa, meningitis; decoction of leaves, rind, or bark in stopping mammary secretions, ulcers, diarrhœa, sore mouth, tonsils, uterine hemorrhages, carbuncles.

2. *J. ni′gra, Black Walnut.*—Bark styptic, acrid; used mostly in dyeing. The rind of green fruit removes ringworms, tetter, diphtheria. Decoction used as a vermifuge. Spirit made by distilling fresh walnuts with alcohol; used in hysteric, cerebral, and pregnant vomiting. All of these fruits contain much fixed oil, which turns red with nitric acid, but brown with nitric and sulphuric acid.

18. SALICACEÆ. Willow Family.

Sal-i-ka′se-e. L. *Sali(x)c* + aceæ, willow, from Celtic, *sal*, near, + *lis*, water, *i. e.*, its favored place of growth, or L. *salire*, to leap—its rapid growing. Trees or shrubs. Distinguished by light wood, bitter bark, alternate, stipulate leaves, diœcious flowers, both kinds in catkins, one to each bract, no perianth; fruit 1-celled, 2–4-valved pod, many-seeded, each with long silky hairs at one end, but covering it; ovary 1-celled, superior; stamens 2 or more; temperate climates; tonic, astringent, febrifuge, stimulant; timber, basket making, seed hair for cushions.

Genera: 1. **Salix.** 2. **Populus.**

SALIX. SALIX (WILLOW).

Salicinum. Salicin, $C_{13}H_{18}O_7$, *official.*

Salix and **Populus** several species. } A neutral principle (glucoside).

Habitat. Europe, N. America; cultivated.

Syn. White or Salicin Willow, Withe, Withy. Fr. Saule blanc, Salicine. Ger. Weidenrinde, Salicin.

Sa′lix. L. see etymology, above, of Salicaceæ.

Pop′u-lus. L. poplar, fr. *populus*, the people, being often planted along the public ways in Rome, where it was called *arbor populi*, tree of the people.

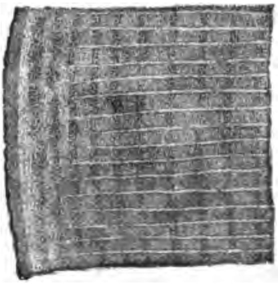
PLANTS.—These two juxta-positioned genera are composed mostly of large trees 15–18 M. (50–60°) high, with flexible branches; *Salix* leaves, long pointed, entire or glandularly toothed. *Populus* leaves, broad, more or less heart-shaped, ovate, toothed; flowers May, both in catkins appearing before the leaves, diœcious, buds covered with scales, or a varnish; barks of both genera resemble; that of salix slips from the wood more readily.

SALICACEÆ.

CONSTITUENTS.—Salicin 1–3 p. c., tannin 12 p. c., extractive matter.

Salicinum. Salicin.—Obtained by several methods. 1. Add litharge to hot concentrated decoction of bark to remove tannin, gum, extractive; filtrate contains salicin and some absorbed lead, this latter is separated by adding sulphuric acid and barium sulphide, now by evaporating filtrate get salicin. Can use basic lead acetate for litharge, when the free acid must be neutralized with calcium carbonate, and filtrate evaporated. 2. Boil bark with milk of lime to remove tannin, evaporate filtrate to soft extract, digest this with alcohol to take out salicin. Occurs in white, silky crystalline needles or powder; odorless, bitter, insoluble in ether, chloroform; soluble in 28 parts water, 30 alcohol, no residue; by dilute acids splits into sugar and saligenin, $C_7H_8O_2$, the latter by further boiling becoming saliretin, $C_{14}H_{14}O_3$, a resinous body. *Tests:* 1. A little heated in test-tube until brown, + a few Cc. water + a drop ferric chloride T. S. gives violet color. 2. With sulphuric acid get red solution, now add water, when solution becomes colorless, depositing dark-red powder, insoluble in water or alcohol. 3. A little heated with 1 Cc. potassium dichromate T. S. + 2 Cc. sulphuric acid gives odor of salicylic aldehyde (or of oil of meadow-sweet, *Ulma'ria (Spiræ'a) Ulmaria*). 4. Aqueous solution is not precipitated by tannin, picric acid or mercuric potassium iodide T. S. (abs. and dif. from alkaloids). Dose, gr. 10–30 (.6–2 Gm.).

FIG. 80.



Willow bark; transverse section, magnified 15 diam.

The *White Willow* (*Salix a'lba*) and *Crack Willow* (*S. fra'gilis*) contain most tannin, the *Purple Willow* (*S. purpu'rea*) most salicin, it being even in the leaves, although largest quantity in bark of young wood. *Po'pulus a'lba*, *P. angustifo'lia*, *P. acumina'ta*, *P. tre'mula*, all yield salicin to a considerable extent.

PREPARATIONS.—(Unoff.) May give in powder, pill, syrup, water, or with liquorice extract, in small and frequent doses.

PROPERTIES.—Bitter tonic, antiperiodic, antipyretic, antiseptic, antiferment. Its action is slower, weaker and depresses heart less than salicylic acid; it is non-toxic, possibly circulates like salicylic acid in the blood as sodium salicylate, and is eliminated chiefly by the urine as salicylic, salicyluric, salicylous acids and saligenin, being first converted in the stomach into glucose and saligenin.

USES.—Acute rheumatism, lower temperature in fevers; relieves pains, reduces arterial swellings, intermittents (not nearly so effective as quinine), coryza, hay fever, influenza, neuralgia, diabetes. Externally, gangrenous wounds, eczema, cancer, burns, fetid perspiration (applied in solution with borax).

19. BETULACEÆ. Birch Family.

Bet-u-la'se-e. L. *Betul-a* + aceæ, fr. Celtic *betu*, the birch, its original name. Trees or shrubs. Distinguished by having astringent resinous bark; flowers monœcious, aments, staminate in the axil of each bract, stamens 2–10, calyx 2–4-parted, pistillate pendulous, calyx none—instead have scaly bracts. Differs from allied Fagaceæ (Cupuliferæ) by superior ovary and absence of cupule, even yet by some included in that order; ovary 2-celled, ovules 1 in each cell; temperate climates; astringent, saccharine, timber, paper, charcoal.

Genus: 1. **Betula.**

BETULA. BIRCH.

Oleum Betulæ Volatile. Volatile Oil of Betula (Oil of Sweet Birch), *official.*

Betula lenta, *Linné.* } A volatile oil from the bark.

Habitat. N. America (Newfoundland to Georgia, Minnesota, Indiana), forests.
Syn. Black, Cherry, Mahogany, Sweet or Spice Birch, Mountain Mahogany.
Bet'u-la. L. see etymology, above, of Betulaceæ.
Len'ta. L. *lentus*, soft, pliant, flexible; *i. e.*, its stems and branches.

Plant.—Tree, 12–24 M. (40–80°) high, .6–1 M. (2–3°) thick; bark dark-brown, close, smooth, sweet, aromatic; leaves 7.5–10 Cm. (3–4') long, 2.5–5 Cc. (1–2') wide, ovate, acuminate, serrate, petiolate; flowers, staminate catkins, 5–7.5 Cm. (2–3') long; pistillate ones much shorter, thicker. The bark is not separable into layers, but the cambium, when wounded in the spring, exudes sweet, acid, edible juice; wood reddish, strong, compact.

Constituents.—Volatile oil, gaultherin, tannin 3.3 p. c., betulin (camphoraceous).

Oleum Betulæ Volatile. Volatile Oil of Betula.—Obtained from the bark by distillation, it is identical with methyl salicylate ($CH_3C_7H_5O_3$), and nearly identical with oil of gaultheria—this latter having an additional terpene. It does not preëxist in dried bark, but is formed by the action of water and an unknown compound upon the neutral principle, gaultherin, a substance analogous to amygdalin. This oil is practically methyl salicylate (99.8 p. c.), therefore has same properties, reactions, tests, sp. gr. 1.180, for which, as well as for oil of gaultheria, it is often sold. Dose, ♏j–10 (.06–.6 Cc.).

Properties.—Stimulant, diuretic, emmenagogue.

Uses.—Rheumatism, gout, scrofula, cutaneous eruptions, bladder troubles, scurvy, intermittent fever.

Allied Plants:

1. *B. a'lba.*—Asia, Europe, N. America (Can. to Penn.). The buds and twigs yield by distillation ⅓ p. c. colorless volatile oil; the wood and bark (in layers) yield brown birch tar, having odor of Russia leather. When this tar is distilled we get *Empyreumatic Oil of Birch. Oleum Rusci.*

2. *B. papyri'fera*, *Paper* or *Canoe Birch* (*White Birch*).—Canada, New York. This has cordate leaves, tough, white bark, splitting into papery layers. Used by the Indians in making canoes.

20. FAGACEÆ (CUPULIFERÆ). Beech Family.

Fa-ga'se-e. L. *Fag-us* + aceæ, fr. Gr. φαγεῖν, to eat, φαγός, the beech, in allusion to the esculent nuts once being used as food. Trees or shrubs. Distinguished by alternate irregular leaves; fruit in a bur or cupule—pistillate involucre; flowers monœcious, staminate, aments, stamens 5–20, pistillate, spikes 1–3, or scaly catkins, involucre; petals none; ovary inferior, 2–6-celled, ovules 1–2 in each cell; fruit 1-seeded nut; temperate climates, tropics; astringent, seed edible, valuable timber.

Genera: 1. **Castanea.** 2. **Quercus.**

CASTANEA. CASTANEA (CHESTNUT).

Castanea dentata, *Marshall* (*Borkhausen*). } The leaves, collected in September, October, while still green.

Habitat. N. America, W. Asia, S. Europe, rich soil.

Syn. European Chestnut, European or Sardian Nut, Folia Castaneæ. Fr. Feuilles de (Châtaignier) Marronnier, Châtaigne. Ger. Kastanie, Kastanienblätter.

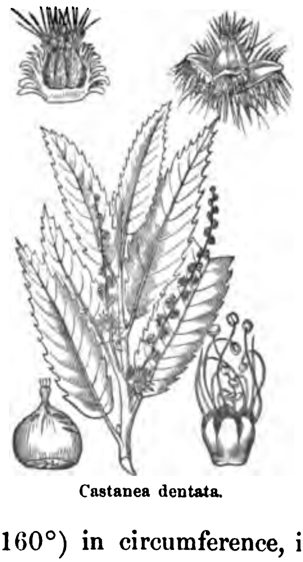
Cas-ta'ne-a. L. fr. *Castanea*, city of Thessaly, famed as the home of the chestnut.

Den-ta'ta. L. *dentatus*, toothed; *i. e.*, the leaves.

Chest'nut. Contr. of *chesten-nut*, nuts of Castane.

PLANT.—Known also as *C. sativa* and *C. vesca* var. *americana*, is a stately tree 24–30 M. (80–100°) high; stem .3–1.3 M. (1–4°) thick, monœcious; bark characteristic; wood light, durable; flowers May–June, staminate white aments, pistillate 3–4 in ovoid involucre, becoming prickly, containing 1–3 nuts. LEAVES, 15–25 Cm. (6–10′) long, 5 Cm. (2′) wide, lanceolate, acuminate, mucronate, petiolate, feather-veined, sinuate-serrate, smooth; odor slight; taste astringent. *Solvents:* boiling water; alcohol partially. Dose, gr. 15–60 (1–4 Gm.).

FIG. 81.



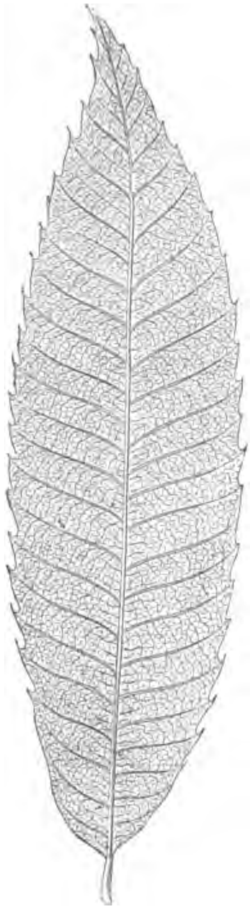
Castanea dentata.

ADULTERATIONS.—*C. pu'mila*, *Chinquapin*, *Que'rcus Pri'nus*, *Chestnut Oak*, leaves, those of the latter have serratures rounded instead of sharp.

Commercial.—American nuts are smaller and sweeter than European. The Great Chestnut of France is 10.5 M. (35°) in circumference, is one thousand years old, perfectly sound, and bears annually; the Mt. Etna Chestnut is 48 M. (160°) in circumference, is hollow, and lives by its bark.

CONSTITUENTS.—Tannin 9 p. c., resin, fat, gum, albumin, ash 6 p. c. (mainly salts, Mg, K, Ca, Fe, carbonates, chlorides, phosphates). Fruit contains starch 35 p. c., fat 2 p. c., proteids 3–4 p. c., sugar 1–2 p. c.

FIG. 82.



Castanea; leaf one-half natural size.

PREPARATIONS.—1. *Extractum Castaneæ Fluidum.* Fluid Extract of Castanea. (Syn., Fr. Extrait liquide de Feuilles de Châtaignier; Ger. Flüssiges Kastanienblätter-Extrakt.)

Manufacture: Macerate 100 Gm. with boiling water 500 Cc., express, pack and percolate with water until exhausted, evaporate the united liquids to 200, add alcohol 60, allow to subside, filter, evaporate to 70, add glycerin 10, and alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Prep.: Infusion, 5 p. c. Dose, ℥ss–1 (15–30 Cc.).

PROPERTIES.—Tonic, mild sedative, astringent.

USES.—Whooping-cough, controlling paroxysms, dysentery, wood resists exposure greatly, nuts very edible, delicacy.

Allied Plants:

1. *C.* (*Fa′gus*) *pu′mila, Castanea* (*Chinquapin*).—The bark official, 1820–1860. Delaware–Mississippi. Shrub or small tree, 6–15 M. (20–50°) high, 25–37.5 Cm. (10–15′) thick, largest being south; leaves differ from chestnut in having underside white, downy; bark grayish, brownish inside; fruit rounded, conical, 12 Mm. (½′) long, 9 Mm. (⅜′) wide at base, same constituents and taste as chestnuts. Bark contains tannin, resin, extractive. Used as tonic, astringent for intermittents.

2. *Fa′gus america′na* (*ferrugi′nea*), *American Beech.*—Tree, 22.5–30 M. (75–100°) high; bark and leaves used, the latter oblong-ovate, taper-pointed, dentate, petioles and midrib soon (nearly) naked, prickles of fruit recurved or spreading; astringent, tonic.

QUERCUS ALBA. WHITE OAK.

Quercus alba, *Linné.* } The bark.

Habitat. N. America (Canada to Florida, west to Minnesota, Texas, etc.).

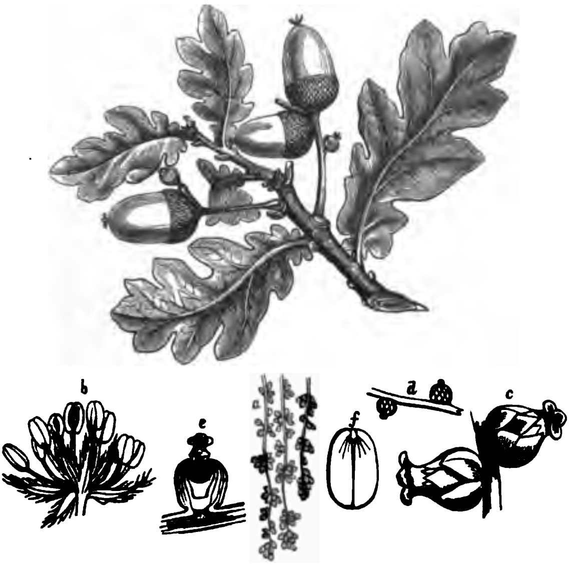
Syn. Tanner's Bark. Fr. Écorce de Chêne. Ger. Cortex Quercus, Eichenrinde.

Quer′cus. L. oak, fr. Celtic *quer*, fine, + *cuez*, a tree—fine, stately tree, or fr. Gr. χοῖρος, a pig; *i. e.*, pigs love and feed on the acorns.

Al′ba. L. *albus*, white; *i. e.*, owing to its wood and bark being so light in color.

PLANT.—Stately tree 18–24 M. (60–80°) high, 1–2.5 M. (3–8°) thick, branches many, spreading; leaves 7.5–15 Cm. (3–6′) long, petioles 12–25 Mm. (½–1′) long, oval, tapering at base, more or less deeply pinnatifid, lobes 4–6, rounded, entire, smooth, light-green above, glaucous with prominent veins beneath, when dry brownish, some remaining on tree all winter; flowers May, monœcious. Staminate in catkins 2.5–7.5 Cm. (1–3′) long; pistillate single or in groups, followed by one-seeded nut (acorn) enclosed at base in a cup, cupule, formed by scaly indurated involucre; fruit 25 Mm. (1′) long, 12 Mm. (½′) broad, ovoid. BARK, in nearly flat pieces, deprived of corky layer, 5 Mm. (⅕′) thick, pale-brown, inner surface with sharp, short longitudinal ridges, tough, fracture coarse, fibrous; odor faint, tan-like; taste strongly astringent. In shops as coarse, fibrous powder, not tingeing saliva yellow. *Solvents:* alcohol; water. Dose, gr. 15–60 (1–4 Gm.).

FIG. 83.



Quercus alba; *a*, staminate catkins; *b*, magnified staminate flower; *c*, pistillate flower with stigmas magnified; *d*, acorn in embryo; *e*, section of young acorn; *f*, cotyledon with radicle.

Commercial.—White oak prefers slightly moist ground. It is almost identical with the European *Q. Ro'bur* (L. *robur*, strong, hard; *i. e.*, its wood), having in common with it variability in length of leaf petioles and acorn stalks as well as depth of leaf lobes; was first brought to England 1724. The bark is collected in spring when it is most astringent, the outer layer discarded, the inner dried—that from young stems and small branches being preferred.

CONSTITUENTS.—Tannin 6–11 p. c., Oak-red, Quercin, resin, pectin.

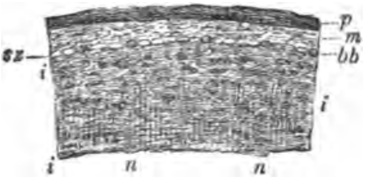
Tannin (Querci-tannic Acid).—Obtained by acetone or washed ether ($+\frac{1}{16}$ vol. water), and is not identical with gallo-tannic acid, as it gives olive-brown with ferric salts, pinkish-red with lime water, and is not convertible into gallic or pyrogallic acid; consists of two forms, one soluble in water ($C_{28}H_{28}O_{14}$), the other difficultly soluble ($C_{28}H_{24}O_{12}$). It is yellowish-brown, amorphous, precipitates with lead acetate, gelatin, albumin, tartar emetic, alkaloids. The young bark contains most, and although it yields sugar with dilute sulphuric acid, some claim it not to be a glucoside.

Oak-red, $C_{28}H_{22}O_{11}$.—Obtained by heating, under pressure querci- (querco-) tannic acid, thereby removing H_2O; it is reddish-brown.

Quercin.—Bitter principle, obtained by boiling bark in acidulated (H_2SO_4) water, adding milk of lime to neutralize, filter, add solution potassium carbonate, dissolve precipitate in alcohol, evaporate when yellow needles slowly form. Some say this is only quercit (oak sugar), $C_6H_{12}O_5$.

PREPARATIONS.—(Unoff.) *Decoction*, 5 p. c. Dose, ℥ss–1 (15–30 Cc.). *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Extract.* Dose, gr. 3–10 (.2–.6 Gm.). *Poultice.*

FIG. 84.



Quercus alba; bark, cross-section, magnified 10 diam.; *p*, cork; *m*, outer bark; *i*, inner bark; *sz*, group of stone cells; *bb*, bast fibre; *n*, long tudinal fibre.

PROPERTIES.—Astringent, tonic, hæmostatic.

USES.—Similar to tannin, anciently for dysentery, hæmoptysis, uterine hemorrhages (by bark pessaries); crushed leaves for relaxed parts, now used especially for bronchial flux; bathe body with decoction for marasmus, scrofula, intermittents, chronic diarrhœa, cholera infantum; injection for leucorrhœa, gonorrhœa; wash in prolapsus ani, hemorrhoids, ulcers; gargle for prolapsed uvula; poultice in gangrene; powder in tooth powders and washes. Persons working in tan vats are said never to have intermittents or phthisis. The wood is very durable, hence, good in shipbuilding, furniture, arts, wheelwrights, coopers, etc.

Allied Plants:

1. *Q. veluti'na* (*cocci'nea* var. *tincto'ria*), *Black* (*Scarlet*) *Oak* (*Quercitron*).—The (inner) bark official, 1820–1880. Trees 24–30 M. (80–100°) high, 1–1.2 M. (3–4°) thick, leaves oblong, lobed, 15–20 Cm. (6–8′) long, mucronate; fruit, acorns, 12–18 Mm. ($\frac{1}{2}$–$\frac{3}{4}$′) long, 12 Mm. ($\frac{1}{2}$′) thick, cupule thick, shallow; bark resembles official, only reddish-brown, gives saliva brownish-yellow color. Contains tannin 6–12 p. c., quercitrin (red-brown coloring-matter, dyeing wool, silks, etc., yellow), $C_{36}H_{38}O_{20}$, with dilute acids yields isodulcit, $C_6H_{14}O_6$, and yellow quercetin, $C_{24}H_{16}O_{11}$. In the South barks of *Q. nigra* and *Q. digitata* (*falcata*), used for this, although these have a much coarser texture and a deep reddish-brown color.

2. *Q. Ro'bur*, *Common European* or *English Oak.*—Tall tree, 24-

30 M. (80–100°) high, having three forms: (*a*) *Q. pube'scens* (old leaves hairy); (*b*) *Q. peduncula'ta* (leaves smooth, pistillate flowers, and fruit on peduncles); (*c*) *Q. sessiliflo'ra* (leaves smooth, flowers and fruit sessile, petioles long). These have many varieties, all resembling official.

3. *Q. digita'ta* (*falca'ta*, L. *falcatus*, *i. e.*, leaf-lobes scythe shape), *Spanish* or *Red Spanish Oak.*—Maryland, Florida. Tree 18–21 M. (60–70°) high, leaves grayish, 3–5-lobed, finger or scythe-shaped. Bark rich in tannin, wood reddish, coarse-grained; used in tanning, sometimes called quercitron.

4. *Q. maryla'ndica* (*ni'gra, ferrugi'nea*), *Black, Barren* or *Iron Oak* (*Black Jack*).—Southern States. Tree 9–12 M. (30–40°) high, leaves cuneate, 3–5-lobed, rusty, pubescent beneath, shining above. Of little value.

5. *Q. virginia'na* (*vi'rens*, L. *vireo*, green, fresh, flourishing), *Live Oak.*—Maryland, Florida. Tree 12–18 M. (40–60°) high. Bark rich in tannin, wood fine-grained; used in ship-building.

6. *Q. su'ber, Cork Oak, Alcornoque* (*Savanna Bark*).—Mediterranean Basin, S. United States. Small tree, 9–15 M. (30–50°) high, leaves toothed, ovate; bark with an elastic suberous layer 2.5–5 Cm. (1–2′) thick, collected every eight to ten years, and constitutes our cork of commerce. When finely powdered, sold as suberin for absorbent purposes, which name is applied to one of its constituents (fat). There are about 80 species of *Quercus*, ranging from shrubs to trees, one-half of these grow in the United States, and can, with their acorns, be used similarly. Acorns are sometimes roasted = *semen quercus tostum*, and used for coffee; contain fixed oil, starch, citric acid, uncrystallized and quercit sugars.

GALLA. NUTGALL.

Quercus lusitanica, *Lamarck.*	An excrescence on this plant caused by the punctures (stings) and deposited ova of *Cynips Gallæ tinctoriæ*; Olivier (Class Insecta, order Hymenoptera).

Habitat. Mediterranean Basin eastward, Greece, Persia, Asia Minor, Syria.

Syn. Galls, Aleppo-, Turkey or Mecca Galls, Mad Apple, Dead Sea Apple, Apple of Sodom, Dyer's Oak, Galla Halepense-, Turcica-, Levantica-, Tinctoria-, Quercina. Fr. Galle de Chêne, Noix de Galle. Ger. Gallæ, Galläpfel, Gallen.

Lu-si-tan'i-ca. L. of or belonging to Lusitania; ancient name of the countries bordering the Mediterranean, especially Portugal, Spain, where the tree is native and where even to-day it flourishes best.

Gal'la. L. for *gall*, fr. Eng. *gallen*, galled = chafed, as a horse, or from its gallish taste.

Plant.—Shrub 1.3–2 M. (4–6°) high, seldom tree-like; leaves 5–7.5 Cm. (2–3′) long, obovate, shallow, roundly lobed; flowers May, catkins; fruit acorn, 2.5–4 Cm. (1–1½′) long, September. Differs from *Q. alba* in being a shrub, leaves less indented, acorns longer, cupules different shaped. Galls, nearly globular, 2.5 Cm. (1′) thick, tuberculated above, smooth below, heavy, hard, olive-green or blackish-gray, often with circular hole near the middle, communicating with central cavity, containing either the partly developed insect or pulverulent remains left by it; nearly inodorous; taste strongly astringent. On outside of cavity have stone cells, outside of this is parenchyma containing the tannin. Light, spongy, and whitish-colored nutgalls should be rejected. *Solvents:* alcohol; water. Dose, gr. 5–30 (.3–2 Gm.).

Commercial.—The tender bark of shoots and the leafy buds are easily stung and punctured by horny ovipositors of female hymenopterous insects; into these galled places they deposit one or more eggs, which set up irritation, thus disturbing circulation and causing surcharged sap to ooze out, which, by evaporation, deposits the solid constituents; this continued, finally evolves a full-grown gall. After the gall is fully developed, but succulent, the insect egg, acting as a centre, hatches, and the larva or grub begins to feed on the juices of surrounding tissue; soon, however, the gall becomes hard, cavity ceases to enlarge, grub becomes full grown and passes into the pupa stage, then into 4-winged fly, 6 Mm. (¼′) long, when it must either die or cut itself out with its mandibles, thus making a small, round opening midway the gall; if this is not done, the remains will be revealed upon cracking open the unpunctured gall. There are several varieties, named according to place of production, although color is the guide to quality: 1. *Aleppo. Syrian.* Bluish or blackish, usually collected before fly has escaped. 2. *Smyrna.* Grayish-olive, intermixed with white galls (least valuable, generally with large openings). 3. *Sorian.* Blackish, size of a pea. These three are exported from Trebizond, Smyrna, Bassorah, Calcutta, Bombay. 4. *European.* Light colored, more spongy, contain much tannin, produced by different cynips. 5. *American.* (*a*) *Q. alba*, light, spongy, little tannin; (*b*) *Q. virginiana* (*virens*), Texas, resembles Aleppo, not tuberculated, contain tannin 40 p. c.; (*c*) *Q. lobata*, California, 5 Cm. (2′) thick, orange-brown, glossy, soft, spongy inside, contain much tannin.

FIG. 85.

Galla; *a*, entire; *b*, vertical section.

CONSTITUENTS.—Tannin 50–60 p. c. (white galls 20–30 p. c.), Gallic acid 2–3 p. c., mucilage, sugar, resin; in the nucleus starch.

Acidum Tannicum. Tannic Acid (Gallo-tannic Acid. Digallic Acid), $HC_{14}H_9O_9$, *official.*—(Syn., Tannin; Fr. Acide Tannique; Ger. Gerbsäure.) Obtained by exhausting powdered nutgall with warm water, cool, agitate the filtrate with one-fourth volume of ether;

the emulsion in ten days separates, yielding an upper ethereal layer (containing coloring matter, fat, resin, gallic and ellagic acids), which is discarded, and a lower aqueous fluid, containing tannin, which is concentrated to a syrupy consistence and spread on tin or glass plates to dry; occurs as a light-yellowish, amorphous powder, faint, characteristic odor, strong astringent taste, darkens by age; soluble in water, alcohol, glycerin, acetone, insoluble in absolute ether, chloroform, benzene; being a glucoside splits easily into glucose and digallic acid by acids or ferments (pectase, etc.); is precipitated blue-black by ferric salts; white with gelatin, blue with lime water; aqueous solution precipitates nearly all alkaloids, bitter principles, gelatin, albumin, starch, tartar emetic (distinction from gallic acid). *Test:* 2 Gm. + boiling water 10 Cc., let cool, should get no turbidity on diluting 5 Cc. of the solution with 10 Cc. alcohol (abs. gum, dextrin), or with 10 Cc. water (abs. of resin). Dose, gr. 1–20 (.06–1.3 Gm.).

Impurities: Gallic acid, glucose, dextrin, gum, resin, coloring matter.

Incompatibles: Alkalies, alkaloids, emulsions, gelatin, ferric salts, mineral acids, salts of antimony, lead and silver.

Acidum Gallicum. Gallic Acid, $HC_7H_5O_5 + H_2O$, *official.*—(Syn., Trioxybenzoic acid, Dioxysalicylic acid; Fr. Acide gallique; Ger. Gallussäure.) Obtained by exposing to the air a mixture of nutgall and distilled water in a thin paste for a month, adding occasionally water to keep semifluid, express, reject liquid, boil residue with distilled water, filter hot through animal charcoal, set aside to crystallize; occurs in white or fawn-colored silky needles; odorless; astringent, acidulous taste, permanent, soluble in 100 parts water, 5 alcohol, 40 ether, 12 glycerin. It is the hydride of tannic acid from which it is often prepared by boiling with dilute sulphuric or hydrochloric acid, or potassa solution, $HC_{14}H_9O_9 + H_2O = 2HC_7H_5O_5$ or conversely $2HC_7H_5O_5 - H_2O = HC_{14}H_9O_9$. It differs from tannic acid in not precipitating alkaloids, bitter principles, gelatin, albumin, starch, tartar emetic. *Tests:* Aqueous solution colored red by potassium cyanide, precipitated blue-black by ferric salts, which color disappears on boiling, not affected by ferrous salts, or gelatin except in presence of gum. Dose, gr. 5–20 (.3–1.3 Gm.).

Impurities: Tannic acid, sugar, dextrin, resin, minerals.

Incompatibles: Ferric and metallic salts, spiritus ætheris nitrosi.

PREPARATIONS.—I. NUTGALL. 1. *Tinctura Gallæ.* Tincture of Nutgall. (Syn., Tincture of Galls; Fr. Teinture de Noix de Galle; Ger. Tinctura Gallarum, Galläpfeltinktur.)

Manufacture: 20 p. c. Percolate 20 Gm. with glycerin 10 Cc., alcohol 90, finishing with latter alone q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

2. *Unguentum Gallæ.* Nutgall Ointment. (Syn., Ointment of Galls; Fr. Pommade de Noix de Galle; Ger. Galläpfelsalbe.)

Manufacture: 20 p. c. Nutgall 20 Gm., benzoinated lard, 80.

Unoff. Preps.: Fluid Extract. Dose, ♏v–30 (.3–2 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.).

II. TANNIC ACID.—1. *Glyceritum Acidi Tannici.* Glycerite of Tannic Acid. (Syn., Fr. Glycérole de Tannin, Glycérine Tannique; Ger. Tannin-Glycerit (Glycerol).)

Manufacture: 20 p. c. Tannic acid 20 Gm., glycerin 80. Heat together until dissolved.

2. *Trochisci Acidi Tannici.* Troches of Tannic Acid. (Syn., Fr. Tablettes (Pastilles) de Tannin; Ger. Tanninpastillen.)

Manufacture: Tannic acid 6 Gm., sugar 65, tragacanth 2, stronger orange flower water q. s. 100 troches. Dose, 1–3 troches.

3. *Unguentum Acidi Tannici.* Ointment of Tannic Acid. (Syn., Fr. Pommade de Tannin; Ger. Tanninsalbe.)

Manufacture: 20 p. c. Tannic acid 20 Gm., benzoinated lard 80.

4. *Collodium Stypticum.* 20 p. c. Externally.

III. GALLIC ACID.—1. *Pyrogallol. Pyrogallol,* Pyrogallic Acid, $C_6H_3(OH)_3$. (Syn., Acidum Pyrogallicum; Fr. Acide pyrogallique; Ger. Pyrogallolum, Pyrogallussäure.) Triatomic phenol, obtained by heating under pressure gallic acid (dried or in aqueous solution), $HC_7H_5O_5 + \text{heat} = C_6H_3(OH)_3 + CO_2$; yield 30–75 p. c.; occurs in light, white, shining laminæ or fine needles; odorless, bitter taste, soluble in 1.7 parts water, 1 alcohol, 1.2 ether; oxidizes and darkens by age, hence should be kept in dark amber bottles.

PROPERTIES.—I. NUTGALL: Astringent, tonic; constringes muscular tissue, thus checking secretions, hemorrhages, local inflammations, etc.

II. TANNIC ACID: Local astringent. Internally contracts blood-vessels, restrains peristalsis (constipates), coagulates mucous secretions, prevents secretion of gastric and intestinal juices, precipitates pepsin, etc.; it is converted into gallic acid in the intestines, and until this change is effected it can not become absorbed to act as a remote or systemic astringent, simply being able to control locally gastric and intestinal bleeding. Externally, astringent, coagulates blood, albumin and gelatin (tans tissues), is hæmostatic, antiseptic, depressant, irritant; the salts have no astringency.

III. GALLIC ACID: Remote astringent, but not to taste, nor to raw and bleeding surfaces; internally controls systemic hemorrhage (contracts blood-vessels) and secretions such as of urine and sweat; does not constipate like tannic acid, and is eliminated by the kidneys unchanged.

USES.—I. NUTGALL: Chronic diarrhœa, dysentery, gleet, leucorrhœa, antidote to tartar emetic and alkaloids (emetine, morphine, colchicine, strychnine, etc.), constringes the stomach, thus delaying absorption, forming of the alkaloids insoluble tannates. In cases of poisoning give infusion freely. Locally infusion as gargle for relaxed mucous membrane of mouth, throat, vagina, rectum; ointment with 5–10 p. c. opium, good in hemorrhoids after inflammatory stage. Chiefly used for obtaining tannic and gallic acids, for ink, dyeing, tanning.

II. TANNIC ACID: Hemorrhages, diarrhœa, dyspepsia, cholera, relaxed uvula, coryza, inflamed fauces, diphtheria, toothache, aphthæa, excessive salivation, leucorrhœa, chapped nipples, gleet, gonorrhœa, ulcers, piles, chilblains, chronic bronchitis, whooping-cough, phthisis, influenza, ozæna, fissures, hemorrhoids, prolapsus ani and uteri, vesical catarrh, hemorrhage after extracting teeth, spongy gums (contracts vessels, checks absorption, hence loosening of teeth), obtunds sensitive dentine, either alone or combined with morphine and creosote, to toughen mucous membranes, skin around nipples, conjunctivitis, erectile tumors, ingrowing toenails; aqueous solutions (1 to 50) may be injected into urethra and bladder, but should never be used hypodermically.

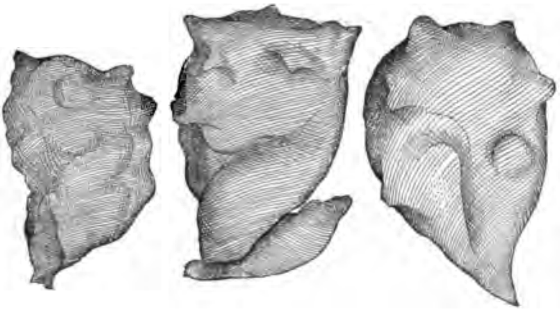
III. Gallic Acid : Menorrhagia, purpura, epistaxis, hæmoptysis, hæmatemesis, hemorrhage of stomach, intestines, lungs, kidneys, night-sweats, polyuria, Bright's disease, dyspepsia, pyrosis, alopecia.

IV. Pyrogallol : Psoriasis, syphilitic ulcers, lupus, epithelioma, parasiticide for ringworm. Must not be applied over great surface, as absorption may poison; not used internally; ointment 1–5–10 p. c.

Allied Products:

1. *Chinese Nutgalls* (*Rhus semiala'ta*) by sting of *A'phis sine'nsis.*—Galls 4–5 Cm. (1½–2′) long, ovate, irregular, tuberculate, grayish-downy, hollow; shell thin, fragile, containing many insect-remains.

Fig. 86.



Chinese Nutgalls.

2. *Japanese Nutgalls* (*R. semiala'ta* or *R. japo'nica*) resemble Chinese.—The tannic acid of these differs from that of official galls.

3. *Vallonea, Acorn Cups* of many *Quercus* species (*Q. Robur, Q. Vallo'nea, Q. Ægil'ops*), 2.5 Cm. (1′) in diameter, with thick, spreading scales, strongly astringent taste, largely used in tanning.

4. *Tamarisk Galls* (*Ta'marix articula'ta* (*orienta'lis*), *T. africa'na, T. ga'llica*).—Asia, Africa, 3–12 Mm. (⅛–½′) thick, subglobular, knotty, contain 40–50 p. c. tannin.

5. *American Nutgalls* (*Q. alba, Q. virginiana* (*virens*), *Q. lobata*), first poor in tannin; second (Texas) like Aleppo, but not tuberculate, 40 p. c. tannin; third (California), 5 Cm. (2′) thick, glossy, orange-brown, rich in tannin.

RECAPITULATION No. 2.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Liliaceæ: 1. Aloe Barbadensis. 2. Barbadoes Aloes.	Aloe vera.	The inspissated juice.	India, N.E. Africa, Barbadoes.	Aloin, resin, volatile oil, emodin.	....	Cathartic, drastic, emmenagogue, vermifuge.	Costiveness, jaundice, hemorrhoids, amenorrhœa, ascarides.	½–10 (.03–.6 Gm.)
Convallariaceæ: 1. Convallaria. 2. Convallaria.	Convallaria majalis.	The rhizome and roots.	United States, Europe, Asia.	Convallamarin, convallarin, resin.	Fluid extract.	Heart-tonic, emetic, purgative, diuretic, sternutatory.	Dropsy, heart-disease, palpitation, pneumonia, typhoid.	2–10 (.13–.6 Gm.)
1. Colchici Radix. 2. Colchicum Root.	Colchicum autumnale.	The corm.	C. and S. Europe, N. Africa.	Colchicine, colchicein, starch, colchicoresin, fixed oil, sugar.	Extract, fld. extr., wine.	Alterative, cathartic, emetic, sedative, diuretic, diaphoretic.	Gout, rheumatism, skin troubles, prurigo, urticaria, neuralgia.	2–8 (.13–.5 Gm.)
1. Colchici Semen. 2. Colchicum Seed.		The seed.			Fld. extr., tinct., wine.			1–5 (.06–.3 Gm.)
Smilaceæ: 1. Sarsaparilla. 2. Sarsaparilla.	Smilax: officinalis, medica, papyracea.	The root.	Trop. America, Mexico.	Parillin, saponin, volatile oil, resin, starch, Ca oxalate, coloring.	Compd. decoc., fld. extr., compd. syr., compd. fld. extr.	Alterative, diuretic, diaphoretic, tonic.	Blood purifier in scrofula, skin diseases, syphilis, abscesses, ulcers.	30–120 (2–8 Gm.)
Iridaceæ: 1. Iris. 2. Iris (Blue Flag).	Iris versicolor.	The rhizome and roots.	N. America.	Resin, camphor, alkaloid(?), fat, sugar, tannin.	Extract, fluid extract.	Cathartic, cholagogue, emetic, diuretic, alterative.	Costiveness, liver trouble.	5–20 (.3–1.3 Gm.)
1. Crocus. 2. Saffron.	Crocus sativus.	The stigmas.	W. Asia.	Volatile oil, fixed oil, crocin, picrocrocin, mucilage, proteids.	Tincture.	Diaphoretic, carminative, emmenagogue, antispasmodic, anodyne, stimulant.	Dyspepsia, dysmenorrhœa, measles, coughs, asthma, rheumatism, bruises, hemorrhoids.	5–30 (.3–2 Gm.)
Zingiberaceæ: 1. Cardamomum. 2. Cardamom.	Elettaria repens.	The fruit.	Malabar, India.	Volatile oil, fixed oil, starch, salts.	Tinct., tinct. co., extr. colocy. co., tr. gent. co., pulv. arom., tr. rhei, tr. rhei dulc.	Carminative, stimulant, aromatic, condiment.	As adjuvant or corrective to cordials, tonics, purgatives, flavors.	5–15 (.3–1 Gm.)
1. Zingiber. 2. Ginger.	Zingiber Zingiber (officinale).	The rhizome.	India, Africa, Hindostan.	Volatile oil, gingerol, resin, starch, mucilage.	Fld. extr., syrup, oleoresin, tinct., troches, pulv. arom., pulv. rhei comp.	Carminative, stimulant, sternutatory, rubefacient, anodyne, sialagogue.	Dyspepsia, diarrhœa, cholera, bronchitis, rheumatism, toothache, headache, colic.	5–20 (.3–1.3 Gm.)
Orchidaceæ: 1. Cypripedium. 2. Cypripedium (Ladies' Slipper).	Cypripedium: hirsutum (pubescens), parviflorum.	The rhizome and roots.	N. America.	Volatile oil, fixed oil, acid, resin, tannin.	Fluid extract.	Antispasmodic, diaphoretic, stimulant.	Chorea, hysteria, epilepsy, hypochondriasis, neuralgia, insomnia.	15–30 (1–2 Gm.)

1. **Vanilla.** 2. **Vanilla.**	**Vanilla planifolia.**	**The fruit.**	**E. Mexico.**	**Vanillin, fixed oil, resin, sugar, mucilage.**	**Tincture, troches of iron.**	**Carminative, stimulant, aphrodisiac, irritant.**	**Hysteria, flavoring** agent.	**5–30 (.3–2 Gm.)**
Piperaceæ:								
1. Cubeba. 2. Cubeb.	Cubeba (Piper) Cubeba.	The unripe fruit.	Java, Sumatra, Borneo, W. Indies.	Volatile oil, resin, fat, cubebin, cubebic acid.	Fld. extr., oleoresin, troches, tincture, oil.	Diuretic, stimulant, carminative, irritant.	Gonorrhœa, cystitis, bronchitis, catarrh, vesical irritability.	15–60 (1–4 Gm.)
1. Piper. 2. Pepper (Black Pepper).	Piper nigrum.	The unripe fruit.	S. India, Malabar.	Piperin, volatile oil, piperidine, chavicin, fat.	Oleoresin, piperin.	Stimulant, tonic, febrifuge, irritant, antipyretic.	Intermittents, rheumatism, colic, headache, indigestion, gleet.	5–20 (.3–1.3 Gm.)
1. Matico. 2. Matico.	Piper angustifolium.	The leaves.	Tropical America.	Volatile oil, artanthic acid, resin, bitter principle, tannin, mucilage.	Fld. extr., tinct.	Stimulant, tonic, styptic, diuretic, aphrodisiac, vulnerary.	Bronchitis, gonorrhœa, menorrhagia, hemorrhoids, hemorrhage, vesical catarrh.	15–60 (1–4 Gm.)
Juglandaceæ:								
1. Juglans. 2. Juglans (Butternut).	Juglans cinerea.	The bark of the root.	N. America.	Nucin, fixed oil, volatile oil, tannin, resin.	Extract.	Cathartic, tonic, rubefacient.	Costiveness, dysentery, intermittents.	60–120 (4–8 Gm.)
Salicaceæ:								
1. Salicinum. 2. Salicin.	Salix and Populus species.	A neutral principle.	Europe, N. America.	$C_{13}H_{18}O_7$.	....	Bitter, tonic, antiperiodic, antipyretic, antiseptic, antiferment.	Rheumatism, intermittents, coryza, neuralgia, diabetes, eczema, cancers, relieves pain.	10–30 (.6–2 Gm.)
Betulaceæ:								Minims.
1. Oleum Betulæ Volatile. 2. Volatile Oil of Betula (Oil of Sweet Birch).	Betula lenta.	The volatile oil.	N. America.	....	....	Stimulant, diuretic, emmenagogue.	Rheumatism, scrofula, skin troubles, bladder complaints, scurvy, intermittents.	1–10 (.06–.6 Cc.)
Fagaceæ (Cupuliferæ):								Grains.
1. Castanea. 2. Castanea (Chestnut).	Castanea dentata.	The leaves.	N. America, Asia, Europe.	Tannin, resin, fat, gum, albumin.	Fluid extract.	Tonic, mild sedative, astringent.	Whooping-cough, dysentery, intermittents.	15–60 (1–4 Gm.)
1. Quercus alba. 2. White Oak.	Quercus alba.	The bark.	N. America.	Tannin, oak-red, quercin, resin, pectin.	....	Astringent, tonic, hæmostatic.	Dysentery, hemorrhages, intermittents, leucorrhœa, hemorrhoids, ulcers, gargles, etc.	15–60 (1–4 Gm.)
1. Galla. 2. Nutgall.	Quercus lusitanica.	The excrescence.	Mediterranean Basin.	Tannin, gallic acid, resin, starch.	Tinct., oint., *Tannin:* glycerite, troch., oint., stypt. collodion, gallic acid, pyrogallic acid.	Astringent, tonic.	Diarrhœa, gleet, relaxed membranes, sore mouth, antidote to alkaloidal poisoning.	5–30 (.3–2 Gm.)

21. ULMACEÆ. Elm Family.

Ul-ma′se-e. *Ulm-us* + aceæ, fr. Saxon *elm* or *ulm*, its original name in all Celtic dialects. Trees, shrubs. Distinguished by leaves alternate, serrate, stipulate; sap not milky; flowers small, 3–9-parted or sepals; petals none, stamens 3–9; ovary 1-celled, superior; fruit 1-seeded, samara, drupe or nut; universal; demulcent, nutritive, astringent, tonic, timber.

Genus: 1. **Ulmus.**

ULMUS. ELM (SLIPPERY ELM).

Ulmus fulva, *Michaux.* } The inner bark.

Habitat. N. America, New England, S. Carolina, west to Louisiana, Nebraska.

Syn. Moose, Red, Indian, Sweet or American Elm; British Tea (the leaves), Cortex Ulmi Interior. Fr. Écorce d'Orme (fauve). Ger. Ulmen rinde, Rüsterrinde.

Ul′mus. L. see etymology, above, of Ulmaceæ.

Ful′va. L. *fulvus*, deep-yellow, tawny; *i. e.*, the color of the liber bark.

PLANT.—Large tree, 15–18 M. (50–60°) high, .3–.6 M. (1–2°) thick; bark and wood reddish-brown, branches rough, whitish; leaves large, 10–20 Cm. (4–8′) long, 5–7.5 Cm. (2–3′) broad, oblong, acuminate, unequal at subcordate base, unequally serrate, pubescent; rough on both sides, petiolate, buds covered with dense russet down; flowers April, small, appearing before leaves, sessile, in clusters, calyx downy, corolla wanting; fruit samara, 12–18 Mm. (½–¾′) long, flat, broadly oblong, entire, notched, 1-celled, wing yellow, silky with short fulvous hairs. INNER BARK, deprived of brown periderm, in flat pieces, varying in length and width, 3 Mm. (⅛′) thick, tough, pale-brownish-white, inner surface finely ridged, fracture fibrous, mealy, transverse section delicately checkered; odor slight, fenugreek-like, peculiar; taste mucilaginous, insipid, powder light-fawn. *Solvent:* water. Dose, ʒij–4 (8–15 Gm.).

ADULTERATIONS.—With more brittle, less fibrous and mucilaginous barks; the powdered drug with corn meal, flour, starches.

Commercial.—This tree flourishes in open high places, firm dry soil; it is distinguished from *U. america′na, White Elm,* by its rougher branches, leaves and buds, also by character of flowers and seeds. Bark should be collected in spring, deprived of epidermis and dried. For this, entire trees are felled in Michigan and other Western States, peeled and wood burnt or allowed to decay.

CONSTITUENTS.—Mucilage, starch; European bark also contains tannin and bitter principle.

Mucilage.—Resembles that of flaxseed; is precipitated by lead acetate, but alcohol separates from its solution a gelatinous liquid.

PREPARATIONS.—1. *Mucilago Ulmi.* Mucilage of Elm. (Syn., Fr. Mucilage d'Écorce d'Orme fauve; Ger. Ulmenrinden-Schleim.)

Manufacture: 6 p. c. Digest 6 Gm. in water q. s. 100 Cc. for one hour, on water-bath, strain; always make fresh. Dose, *ad libitum.*

Unoff. Preps.: Poultice. Uterine tents, etc.

Properties.—Demulcent, emollient, nutritive.

Uses.—Dysentery, diarrhœa, diseases of urinary passages, bronchitis. Externally: finely ground or powdered bark mixed with hot water into pasty mass and used as a poultice for inflammations, boils, etc.; in shape of tents to dilate fistulæ, strictures, os uteri, also in form of vaginal and rectal suppositories.

Allied Plants:

1. *U. campe'stris.*—Europe. Bark thinner than official, cinnamon color, mucilaginous, bitterish, astringent. *U. effu'sa, Black Elm*, bark very similar. *U. america'na.* New England, chiefly shade tree. *U. ala'ta, Wahoo.* S. United States. Bark used in making ropes.

22. MORACEÆ. Mulberry Family.

Mo-ra'se-e. L. *Mor-us* + aceæ, fr. Celtic *mor*, black, alluding to the fruit's color. Trees, shrubs, herbs. Distinguished by leaves alternate or opposite, stipulate; sap milky; flowers monœcious or diœcious; calyx 4–5-parted, petals none, staminate panicled, pistillate capitate, cymose; ovary superior, 1-celled, ovule solitary; fruit various; universal; narcotic, sedative, tonic, astringent, fibres.

Genera: 1. **Ficus.** 2. **Humulus.** 3. **Cannabis.**

FICUS. FIG.

Ficus Carica, *Linné*. } The fleshy receptacle, bearing fruit upon its inner surface.

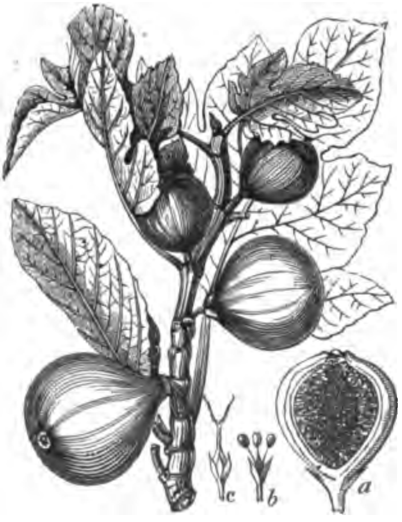
Habitat. W. Asia; cultivated in subtropics, Italy, France, California.

Syn. Ficus Passa, Fici, Fructus Caricæ. Fr. Figues. Ger. Caricæ, Feigen.

Fi'cus. L. fr. Celtic *figueren*, Teutonic *fiege*, Saxon *fic*, Eng. fig, Gr. *συκῆ*.

Car'i-ca. L. name used by the Latins for dried fig, fr. *Caria*, in Asia Minor; *i. e.*, the habitat.

Fig. 87.



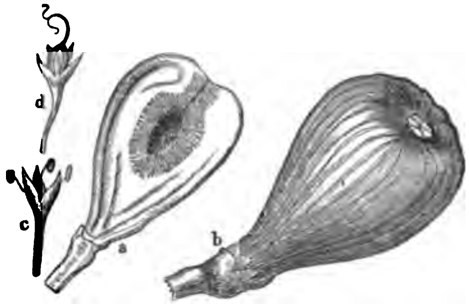
Ficus Carica; *a*, vertical section of fruit; *b*, staminate flower; *c*, pistillate flower.

Plant.—Small tree 4.5–7.5 M. (15–25°) high, 10–20 Cm. (4–8') thick, trunk divided into many spreading branches; bark reddish or gray; leaves 10–12.5 Cm. (4–5') long, 3–5-palmately bluntly lobed, dentate, deep-green, downy beneath; flowers staminate and pistillate, in the hollow, thick, fleshy-walled receptacle, which becomes the fruit. Fruit, compressed or irregular shaped, fleshy, brownish-yellow, covered with effloresced sugar; sweet, fruity odor; sweet, mucilaginous taste, pear-shaped when softened in water, 5–7.5 Cm. (2–3′) long, scar or short stalk at base, small, scaly orifice at apex ; inside hollow and covered with many yellow, hard achenes. Dose, *ad libitum*.

Commercial.—Figs may dry on trees, but are usually gathered and dried by the sun, sometimes in ovens, packed with pressure into drums or boxes, under the name of *natural figs ;* others are kneaded, squeezed, pulled so as to be pliant, then packed under the name of *pulled figs.* The largest and best are Smyrna, Turkey or Eleme figs ; the smaller and less pulpy are Greek figs.

CONSTITUENTS.—Grape sugar 62 p. c., gum, fat, salts, achenes and cellular tissue 15 p. c., water 16 p. c.

FIG. 88.



Ficus Carica ; *a*, vertical section of common receptacle ; *b*, ripened fruit ; *c*, staminate flower ; *d*, pistillate flower.

PREPARATION.—1. *Confectio Sennæ*, 12 p. c. Dose, ʒj–2 (4–8 Gm.).

PROPERTIES.—Nutritious, demulcent, laxative, dietetic.

USES.—Habitual constipation, eaten as a diet. The indigestible seeds and skin act mechanically to set up intestinal irritation, hence purgation, diarrhœa, pains, flatulency. May roast or boil, split open and apply as a suppurative poultice to gum-boils, abscesses of anus and vulva, cancerous fetor, etc.

Allied Plants :

1. *Mo′rus ru′bra, Red Mulberry.*—N. America. Fruit in dense spikes with coalesced perianths, 2.5 Cm. (1′) long, dark-purple, fleshy. Contains sugar 10 p. c., pectin, citrates, malates ; refrigerant, flavoring.

2. *Dorste′nia Contraye′rva, Contrayerva.*—The root official, 1820–1860. W. Indies, C. and S. America. Acaulescent perennial ; leaves lobed, radical, 10 Cm. (4′) long ; flowers staminate and pistillate, fruit capsule, disperses seeds by hygroscopism ; root (rhizome) fusiform, 1–2-headed, 5–7.5 Cm. (2–3′) long, 12 Mm. ($\frac{1}{2}$′) thick, reddish ; taste acrid, bitter. Contains volatile oil, resin, bitter principle, starch. Used as stimulant, tonic, diaphoretic, for low fevers, typhoid, diarrhœa, dysentery, serpent bites ; in decoction, tincture. Dose, gr. 30 (2 Gm.).

HUMULUS. HOPS.

Humulus
Lupulus, *Linné.* } The strobiles.

Habitat. N. Temperate Zone, in hedges, thickets; cultivated in N. America (New Eng., N. Y., Mich.), Europe (England, Germany), C. Asia, Brazil, Australia.

Syn. Br. Lupulus, Strobili (Humuli) Lupuli, Hop. Fr. Houblon. Ger. Hopfen.

Hu′mu-lus. L. *humus*, the ground ; *i. e.*, the plant creeps on the ground unless supported.

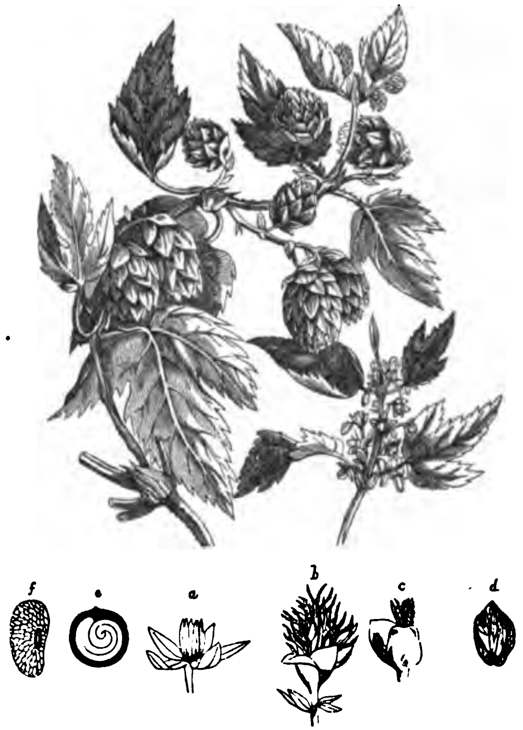
MORACEÆ.

Lu′pu-lus. L. dim. of *lupus*, a wolf; *i. e.*, it is wolfish, because it strangles the shrubbery upon which it climbs.

Hops, OE. *hoppen*, to climb; *i. e.*, plant leaps or hops from one place or support to another.

PLANT.—Perennial, herbaceous twiner; root large, thick, branched; stems several, 6 M. (20°) long, striated, angular, rough, flexible, entwining left to right; leaves 7.5–10 Cm. (3–4′) long, cordate, 3–5-palmate-lobed, petiolate, scabrous with minute prickles, stipulate, dark-green; flowers July–August, diœcious, axillary, the staminate yellowish-white racemes, pistillate densely leafy, pale-green, cone-like spikes, which produce the fruit (strobile). STROBILES, ovate, 3 Cm. (1¼′) long, consisting of a thin, hairy, undulated axis and many obliquely ovate membranous greenish scales, upper portion reticulately veined, toward the base parallel-veined, glandular, and surrounding a small subglobular achene, which is likewise covered with numerous yellow, shining glands (lupulin) in which most of the drug's strength resides; odor aromatic; taste bitter, aromatic, astringent. Should not be used after a year old. *Solvents:* diluted alcohol; boiling water. Dose, ʒss–1 (2–4 Gm.).

FIG. 89.



Humulus Lupulus; *a*, staminate flower; *b*, pistillate flower; *c*, sepal; *d*, bract; *e*, embryo; *f*, lupulinic gland (lupulin).

Commercial.—Hops ripen in Sept., when they are picked, dried carefully by fire in kilns, packed in hempen bales or bags and sent into market. If of good color and aroma, are usually sold in bulk for brewing and the retail drug trade, while those of off-color (brown by age and exposure) and of rankish odor (valerianic acid), hence inferior, are tightly compressed into varying-size rectangular cakes; or they may be bleached by sulphur dioxide, thus retarding oxidation, and then bartered loosely, but when thus treated must be aired for a month at least before being used in medicine or beer. Manufacturers of the beverages will not knowingly make use of such, but this seems to be without valid reason.

CONSTITUENTS.—Volatile oil 0.8 p. c., resin 9–18 p. c., asparagin, choline, tannin, $C_{25}H_{24}O_{13}$, 4 p. c., ash 7–10 p. c. (=K, Ca, Si, H_3PO_4).

PREPARATIONS.—1. *Tinctura Humuli.* Tincture of Hops. (Syn., Br. Tinctura Lupuli; Fr. Teinture de Houblon; Ger. Hopfentinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Gm.).

Unoff. Preps.: Extract. Dose, gr. 3–10 (.2–.6 Gm.). *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Infusion,* 5 p. c. Dose, ℥j–4 (30–120 Cc.). *Poultice.*

PROPERTIES.—Tonic, sedative, anodyne, hypnotic. Somewhat diaphoretic, astringent, anaphrodisiac, diuretic, stomachic, carminative. Increases heart action, skin circulation; after slight cerebral excitement have calm, soporific effect. Tonic is due to bitter principle—lupamaric (lupulinic) acid; stimulant then sedative, due to volatile oil. Aromatic and bitter virtues reside mostly in the glands (lupulin).

USES.—Dyspepsia, delirium tremens, priapism, seminal emissions, incontinence of urine, irritable bladder. Externally in rheumatism, abscesses, spasms, colic, toothache, bruises; for these use poultice made by moistening hops with hot water, vinegar, alcohol or laudanum, enclosing in porous cloth and applying while hot to painful part. Tincture with tincture of capsicum good in a debauch as a substitute for alcoholic drinks.

Allied Plant:

1. *Urti'ca dioi'ca, Nettle* (*Stinging Nettle*), Urticaceæ.—N. America, Europe. Plant .6–1 M. (2–3°) high, very bristly, stinging, leaves ovate, heart-shaped, pointed, serrate, downy beneath, upper stem downy, spike much branched. Tonic, astringent, uterine hemorrhage. Dose, gr. 15–30 (1–2 Gm.).

LUPULINUM. LUPULIN.

Humulus Lupulus, *Linné.* } The glandular powder separated from the strobiles.

Syn. Lupulina, Lupulinic Glands. Fr. Lupuline, Lupulite. Ger. Glandulæ Lupuli, Lupulin, Hopfenmehl.

Lupulin consists of minute granules; in mass bright-brownish-yellow, becoming yellowish-brown and resinous; granules inflammable, under microscope subglobular or hood-shaped, reticulate; odor aromatic; taste bitter. *Tests:* 1. When agitated with water should give no sediment upon standing (sand, etc.). 2. When ignited, residual ash should not be more than 10 p. c. 3. Ether should dissolve 70 p. c., and this solution when evaporated should leave soft extract of hop odor. *Solvents:* alcohol; ether; boiling water. Dose, gr. 5–15 (.3–1 Gm.).

Commercial.—Lupulin is separated by handling or thrashing dried strobiles or by picking off scales, then shaking and rubbing glands through a fine sieve. This powder is washed in water, to get rid of sand, etc., which always settles to the bottom, then well dried and preserved in bottles. Hops yield of these glands 8–16 p. c.

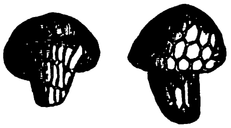
CONSTITUENTS.—Choline (formerly lupuline), Volatile oil 3 p. c. Lupamaric acid, $C_{25}H_{35}O_4$, resin, wax (myricin), ash 5 p. c.

Choline.—This is possibly from the decomposition of lecithin, and on boiling yields trimethylamine; it is a volatile, liquid alkaloid, having conine-like odor, alkaline, not bitter.

Volatile Oil.—Obtained by distillation; consists of a lighter portion, $C_{10}H_{16}$, and a heavier portion, valerol, $C_6H_{10}O$, from which latter by gradual oxidation valerianic acid is obtained.

Lupamaric Acid.—Obtained by treating ethereal extract with alcohol (leaving wax behind), evaporating; dissolve residue in ether, shake solution with potassa solution (removing resin). Shaking with water dissolves potassium lupamarate, which is precipitated by copper sulphate and the precipitate decomposed by hydrogen sulphide yields the acid in bitter white crystals, turning yellow and resinous by age; red with nitric acid, changing to yellow on dilution or with alkalies, soluble in alcohol, ether, chloroform.

FIG. 90.



Lupulin (fresh).

PREPARATIONS.—1. *Extractum Lupulini Fluidum.* Fluid Extract of Lupulin. (Syn., Fr. Extrait liquide de Lupuline; Ger. Flüssiges Lupulin-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

2. *Oleoresina Lupulini.* Oleoresin of Lupulin. (Syn., Oleoresina Lupulinæ, Extractum Lupulini Æthereum; Fr. Oléorésine de Lupuline; Ger. Ætherisches Lupulinextrakt.)

Manufacture: Percolate 100 Gm. with ether until exhausted, recover ether; yield 50–70 p. c. Dose, gr. 2–5 (.13–.3 Gm.).

Unoff. Preps.: Tincture, 12 p. c. (alcohol). Dose, ʒss–2 (2–8 Cc.). *Ammoniated Tincture,* 10 p. c. (ar. spts. ammonia). Dose, ʒss–1 (2–4 Cc.). *Extract.* Dose, gr. 5–10 (.3–.6 Gm.). *Pills.* The pills are best made into mass with a little ether, or by simply rubbing briskly with spatula, thus generating sufficient heat to cause cohesion.

PROPERTIES.—Stimulant, tonic, anodyne. About the same as hops, but stronger, consequently is, as a rule, preferable and more reliable.

USES.—About the same as hops.

CANNABIS INDICA. INDIAN CANNABIS (INDIAN HEMP).

Cannabis sativa, *Linné.* } The flowering tops of the female plant, grown in East Indies.

Habitat. Asia, Persia, hills of N. India; cultivated in India, Europe, C. and S. Russia, Brazil, W. and S. United States.

Syn. Black Indian Hemp, Bangue, Hashish, Halish, Gallow Grass, Hemp or Nick Weed, Bang, Bhang, Gunjah, Churrus, Charas, Ganja (dried flowers). Fr. Chanvre (Indien). Ger. Hanf, Indischer Hanf.

Can′na-bis. L. Gr. κάνναβις, hemp, fr. *ganeh,* its Arabic name. Celtic *can,* reed, + *ab,* small; *i. e.,* its slender stems.

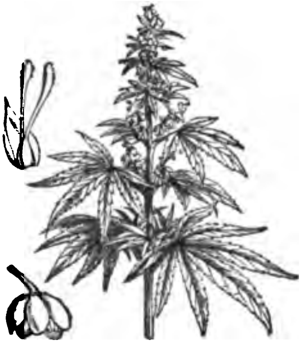
Sa-ti′va. L. *sativus*, that which is sown or planted; *i. e.*, in the gardens and fields for use.

In′di-ca. L. *Indicus.* Gr. 'Ινδικός, pertaining to India; *i. e.*, its habitat.

PLANT.—Annual herb; stem 1–3 M. (3–10°) high, angular, tomentose; leaves palmate-compound; leaflets 5–7, linear, lanceolate, serrate; flowers diœcious, yellow. TOPS, 5 Cm. (2′) long, compressed, brittle, with leaves, leaflets and bracts, each containing two small pistillate flowers, sometimes with the nearly ripe fruit, the whole more or less agglutinated with resinous exudation, color brownish-green; odor peculiar, narcotic; taste acrid. *Solvent:* alcohol. Dose, gr. 2–5 (.13–.3 Gm.).

Commercial.—This was known to the Romans, but not to the Egyptians. At present most of the tops are grown in the two districts, Bogra and Rajshabi, north of Calcutta, being known and called natively by the Hindustani names *gunjah* or *ganja*, and in London as *guaza.* Those plants richest in resin grow at an altitude of 1,800–2,400 M. (6,000 to 8,000°). The collection consists in cutting down plants, after flowering, and forming these into bundles .6–1.3 M. (2–4°) long, 7.5–10 Cm. (3–4′) thick. Genuine *gunjah* either enters market as such or the flowering tops are simply cut off and marketed, when it constitutes our official drug.

FIG. 91.



Cannabis sativa.

CONSTITUENTS.—Cannabin 15–20 p. c., cannabine, cannabinine (choline or bilineurine), cannabinon (balsamic resin, dark-brown sticky mass), cannabinol (cannabindon, dark-cherry-red syrup), volatile oil, $C_{10}H_{16}$, gum, sugar, potassium nitrate.

Cannabin.—This resin constituent (resinoid), in which the medical virtue is supposed to reside, is obtained by treating the drug with water and a solution of sodium carbonate; wash residue with water, dry, exhaust with alcohol, treat tincture with milk of lime, precipitate lime with sulphuric acid, add animal charcoal to filtrate, filter, concentrate and precipitate with water. It is a brown, amorphous resin, burning without ash, soluble in absolute alcohol, from which it is precipitated white by water.

Cannabine.—Alkaloid, and its tannate, bitter yellowish powders; hypnotic. Dose, gr. 1–5 (.06–.3 Gm.).

Cannabinine, $C_5H_{15}NO_2$.—Alkaloid, varnish-like mass or yellowish-brown syrupy liquid, odor of nicotine, soluble in ether, alcohol, sparingly in water; with alkalies get trimethylamine (Siebold's cannabinine).

PREPARATIONS.—1. *Extractum Cannabis Indicæ.* Extract of Indian Cannabis. (Syn., Fr. Extrait de Chanvre Indien; Ger. Indischer Hanf-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. Dose, gr. ⅙–1 (.01–.06 Gm.).

2. *Extractum Cannabis Indicæ Fluidum.* Fluid Extract of Indian Cannabis. (Syn., Fr. Extrait liquide de Chanvre Indien; Ger. Flüssiges Indischer Hanf-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏ij–5 (.13–.3 Cc.).

3. *Tinctura Cannabis Indicæ.* Tincture of Indian Cannabis. (Syn., Fr. Teinture de Chanvre Indien; Ger. Indisch Hanftinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

These preparations give varying results, but usually their value can be recognized by the color of precipitate formed when added to water: if olive-green, it is active; if yellowish-brown, it is inert; thus, whatever there is that destroys chlorophyll injures the active principle.

PROPERTIES.—Anodyne, nervine, sudorific, narcotic, aphrodisiac, increases appetite. It excels even belladonna in perverting perception, condition, and relation of objects; some become pugnacious, others have delightful intoxicating dreams, in which time, distance, and sound are magnified—a few minutes' dream extends over weeks, near objects as in infinite space, whispering as cannonading. Large habitual doses bloat the face, inject eyes, make limbs tremulous, weak, mind imbecilic, death by marasmus; lethal doses cause also unconsciousness, collapse, insensible, dilated pupils, pale, clammy, insensible skin, debility, feeble pulse, catalepsis. Effects last twenty-four hours, which closely resemble opium, but differ in not constipating, and in not lessening secretions; increases appetite.

USES.—Neuralgia, gout, delirium tremens, tetanus, convulsions, chorea, hysteria, mental depression, epilepsy, morphine and chloral habits, softening of the brain, nervous vomiting.

Poisoning: Give emetics, lemon juice to neutralize, tannin, coffee, ammonia, strychnine, atropine, electricity; similar as in chloral or opium.

Incompatibles: Strychnine, caustic alkalies, acids.

Synergists: Alcohol, ether, bromides, cocaine, narcotics.

Allied Native Products:

These are mostly used for smoking, beverages, or electuaries, etc.

1. *Bhang* (*Sidhee*, *Subjee*, *Siddhi*).—Consists of coarsely broken leaves and fruit, dark-green, resembles *gunjah* in odor and taste. Used by natives in their sweet-meat (*majoon*), also smoked with or without tobacco; its cold infusion as an intoxicant.

2. *Churrus* or *Charas*.—This is the resin which exudes spontaneously from the entire plant, in minute drops. It is collected in several different ways: 1. By men wearing leather suits brushing forcibly against growing plants, when resin adheres and is afterward scraped off. 2. By rubbing green portions between the hands and then scraping off adhering resin. 3. By frequent stirring around that put away in barns to cure, the resin is caused to rise in the form of dust, and to deposit upon the roof and sides of the building, from which it can

RECAPITULATION NO. 2.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Liliaceæ:								
1. Aloe Barbadensis. 2. Barbadoes Aloes.	Aloe vera.	The inspissated juice.	India, N.E. Africa, Barbadoes.	Aloin, resin, volatile oil, emodin.	....	Cathartic, drastic, emmenagogue, vermifuge.	Costiveness, jaundice, hemorrhoids, amenorrhœa, ascarides.	½–10 (.03–.6 Gm.)
Convallariaceæ:								
1. Convallaria. 2. Convallaria.	Convallaria majalis.	The rhizome and roots.	United States, Europe, Asia.	Convallamarin, convallarin, resin.	Fluid extract.	Heart-tonic, emetic, purgative, diuretic, sternutatory.	Dropsy, heart-disease, palpitation, pneumonia, typhoid.	2–10 (.13–.6 Gm.)
1. Colchici Radix. 2. Colchicum Root.	Colchicum autumnale.	The corm.	C. and S. Europe, N. Africa.	Colchicine, colchicein, starch, colchicoresin, fixed oil, sugar.	Extract, fld. extr., wine.	Alterative, cathartic, emetic, sedative, diuretic, diaphoretic.	Gout, rheumatism, skin troubles, prurigo, urticaria, neuralgia.	2–8 (.13–.5 Gm.)
1. Colchici Semen. 2. Colchicum Seed.		The seed.			Fld. extr., tinct., wine.			1–5 (.06–.3 Gm.)
Smilaceæ:								
1. Sarsaparilla. 2. Sarsaparilla.	Smilax: officinalis, medica, papyracea.	The root.	Trop. America, Mexico.	Parillin, saponin, volatile oil, resin, starch, Ca oxalate, coloring.	Compd. decoc., fld. extr., compd. syr., compd. fld. extr.	Alterative, diuretic, diaphoretic, tonic.	Blood purifier in scrofula, skin diseases, syphilis, abscesses, ulcers.	30–120 (2–8 Gm.)
Iridaceæ:								
1. Iris. 2. Iris (Blue Flag).	Iris versicolor.	The rhizome and roots.	N. America.	Resin, camphor, alkaloid(?), fat, sugar, tannin.	Extract, fluid extract.	Cathartic, cholagogue, emetic, diuretic, alterative.	Costiveness, liver trouble.	5–20 (.3–1.3 Gm.)
1. Crocus. 2. Saffron.	Crocus sativus.	The stigmas.	W. Asia.	Volatile oil, fixed oil, crocin, picrocrocin, mucilage, proteids.	Tincture.	Diaphoretic, carminative, emmenagogue, antispasmodic, anodyne, stimulant.	Dyspepsia, dysmenorrhœa, measles, coughs, asthma, rheumatism, bruises, hemorrhoids.	5–30 (.3–2 Gm.)
Zingiberaceæ:								
1. Cardamomum. 2. Cardamom.	Elettaria repens.	The fruit.	Malabar, India.	Volatile oil, fixed oil, starch, salts.	Tinct., tinct. co., extr. colocy. co., tr. gent. co., pulv. arom., tr. rhei, tr. rhei dulc.	Carminative, stimulant, aromatic, condiment.	As adjuvant or corrective to cordials, tonics, purgatives, flavors.	5–15 (.3–1 Gm.)
1. Zingiber. 2. Ginger.	Zingiber Zingiber (officinale).	The rhizome.	India, Africa, Hindostan.	Volatile oil, gingerol, resin, starch, mucilage.	Fld. extr., syrup, oleoresin, tinct., troches, pulv. arom., pulv. rhei comp.	Carminative, stimulant, sternutatory, rubefacient, anodyne, sialagogue.	Dyspepsia, diarrhœa, cholera, bronchitis, rheumatism, toothache, headache, colic.	5–20 (.3–1.3 Gm.)
Orchidaceæ:								
1. Cypripedium. 2. Cypripedium (Ladies' Slipper).	Cypripedium: hirsutum (pubescens), parviflorum.	The rhizome and roots.	N. America.	Volatile oil, fixed oil, acid, resin, tannin.	Fluid extract.	Antispasmodic, diaphoretic, stimulant.	Chorea, hysteria, epilepsy, hypochondriasis, neuralgia, insomnia.	15–30 (1–2 Gm.)

1. Vanilla. 2. Vanilla.	Vanilla planifolia.	The fruit.	E. Mexico.	Vanillin, fixed oil, resin, sugar, mucilage.	Tincture, troches of iron.	Carminative, stimulant, aphrodisiac, irritant.	Hysteria, flavoring agent.	5–30 (.3–2 Gm.)
Piperaceæ:								
1. Cubeba. 2. Cubeb.	Cubeba (Piper) Cubeba.	The unripe fruit.	Java, Sumatra, Borneo, W. Indies.	Volatile oil, resin, fat, cubebin, cubebic acid.	Fld. extr., oleoresin, troches, tincture, oil.	Diuretic, stimulant, carminative, irritant.	Gonorrhœa, cystitis, bronchitis, catarrh, vesical irritability.	15–60 (1–4 Gm.)
1. Piper. 2. Pepper (Black Pepper).	Piper nigrum.	The unripe fruit.	S. India, Malabar.	Piperin, volatile oil, piperidine, chavicin, fat.	Oleoresin, piperin.	Stimulant, tonic, febrifuge, irritant, antipyretic.	Intermittents, rheumatism, colic, headache, indigestion, gleet.	5–20 (.3–1.3 Gm.)
1. Matico. 2. Matico.	Piper angustifolium.	The leaves.	Tropical America.	Volatile oil, artanthic acid, resin, bitter principle, tannin, mucilage.	Fld. extr., tinct.	Stimulant, tonic, styptic, diuretic, aphrodisiac, vulnerary.	Bronchitis, gonorrhœa, menorrhagia, hemorrhoids, hemorrhage, vesical catarrh.	15–60 (1–4 Gm.)
Juglandaceæ:								
1. Juglans. 2. Juglans (Butternut).	Juglans cinerea.	The bark of the root.	N. America.	Nucin, fixed oil, volatile oil, tannin, resin.	Extract.	Cathartic, tonic, rubefacient.	Costiveness, dysentery, intermittents.	60–120 (4–8 Gm.)
Salicaceæ:								
1. Salicinum. 2. Salicin.	Salix and Populus species.	A neutral principle.	Europe, N. America.	$C_{13}H_{18}O_7$.	....	Bitter, tonic, antiperiodic, antipyretic, antiseptic, antiferment.	Rheumatism, intermittents, coryza, neuralgia, diabetes, eczema, cancers, relieves pain.	10–30 (.6–2 Gm.)
Betulaceæ:								
1. Oleum Betulæ Volatile. 2. Volatile Oil of Betula (Oil of Sweet Birch).	Betula lenta.	The volatile oil.	N. America.	....	....	Stimulant, diuretic, emmenagogue.	Rheumatism, scrofula, skin troubles, bladder complaints, scurvy, intermittents.	Minims. 1–10 (.06–.6 Cc.)
Fagaceæ (Cupuliferæ):								
1. Castanea. 2. Castanea (Chestnut).	Castanea dentata.	The leaves.	N. America, Asia, Europe.	Tannin, resin, fat, gum, albumin.	Fluid extract.	Tonic, mild sedative, astringent.	Whooping-cough, dysentery, intermittents.	Grains. 15–60 (1–4 Gm.)
1. Quercus alba. 2. White Oak.	Quercus alba.	The bark.	N. America.	Tannin, oak-red, quercin, resin, pectin.	....	Astringent, tonic, hæmostatic.	Dysentery, hemorrhages, intermittents, leucorrhœa, hemorrhoids, ulcers, gargles, etc.	15–60 (1–4 Gm.)
1. Galla. 2. Nutgall.	Quercus lusitanica.	The excrescence.	Mediterranean Basin.	Tannin, gallic acid, resin, starch.	Tinct., oint., *Tannin:* glycerite, troch., oint., stypt. collodion, gallic acid, pyrogallic acid.	Astringent, tonic.	Diarrhœa, gleet, relaxed membranes, sore mouth, antidote to alkaloidal poisoning.	5–30 (.3–2 Gm.)

Genus: 1. **Aristolochia.**

SERPENTARIA. SERPENTARIA (VIRGINIA SNAKEROOT).

Aristolochia { **Serpentaria,** *Linné.* / **reticulata,** *Nuttall.* } The rhizome and roots.

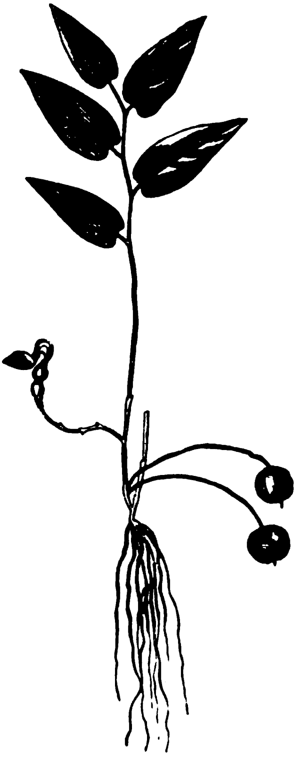
Habitat. United States, in hilly woods: 1. In Middle, Southern, and Western States east of Mississippi River. 2. S. W. States, Louisiana to Texas, called Red River or Texas Snakeroot.

Syn. Snakeroot or Snakeweed, Snagrel, Sangrel, Sangree Root, Pelican Flower, Birthwort, Thick Birthwort. Br. Serpentariæ Rhizoma (radix), Serpentary Rhizome. Fr. Couleuvrée de Virginie, Serpentaire (Vipérine) de Virginie. Ger. Virginische Schlangenwurzel.

Ar-is-to-lo′chi-a. L. see etymology, page 165, of Aristolochiaceæ.
Ser-pen-ta′ri-a. L. *serpen(t)s*, serpent; *i. e.*, having serpent-curing powers.
Re-tic-u-la′ta. L. *reticulatus*, fr. *rete*, a net; *i. e.*, leaves strongly netted.
Virginia Snakeroot. Root from Virginia, good against snake bites.

PLANTS.—Perennial herbs; stems sometimes several, slender, erect, zigzag, jointed, .3 M. (1°) high, purple below; leaves cordate, ovate, 5–7.5 Cm. (2–3′) long, pale-green, entire; flowers June–July, few, purple, due to the calyx, which is tubular, inflated at both ends and bent like letter S; corolla absent. *A. Serpentaria* has leaves petiolate, pointed, thin, pubescent. *A. reticulata* has leaves subsessile, obtuse, thickish, reticulate, hairy. RHIZOME, 2.5 Cm. (1′) long, 3 Mm. (⅛′) thick, horizontal, thin, bent, upper side with approximate short-stem bases; on lower many thin branching roots, 10 Cm. (4′) long, dull-yellowish-brown, internally whitish, wood-wedges longest on under side; odor aromatic, camphoraceous; taste warm, bitterish, camphoraceous. The roots of *A. reticulata* are coarser, longer, less interlaced than *A. Serpentaria*. *Solvents:* alcohol; diluted alcohol; boiling water. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 92.



Aristolochia Serpentaria.

ADULTERATIONS. — *Spigelia marylandica;* not aromatic, not bitter, has no projecting stem-remnants, has in the wood indistinct medullary rays. *Hydrastis canadensis;* yellow internally, no odor, upright growth. *Aristolochia Serpentaria* var. *hasta′ta*. S. Ca., La.; leaves auriculate, stems smaller, more slender and simple. *Cypripedium hirsutum* (*pubescens*) and *C. parviflorum;* scars circular, roots coarse. *Polemo′nium re′ptans* and *Panax quinquefolium, Ginseng;* the former resembles closely serpentaria, but is nearly white.

CONSTITUENTS.—Volatile oil ½–1 p. c., Aristolochine, resin, tannin, starch, sugar, mucilage, albumin, ash 11 p. c.

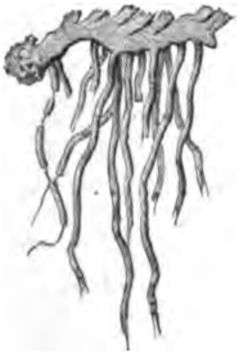
Volatile Oil.—Obtained by distilling with water; contains a terpene (probably pinene), $C_{10}H_{16}$, also borneol ester, $C_{18}H_{29}O$, 60 p. c., and a green or bluish-green fraction.

Aristolochine, $C_{32}H_{22}NO_{13}$.—Obtained by precipitating decoction with lead acetate, exhausting precipitate with hot alcohol, evaporating, dissolving bitter principle (alkaloid) by shaking with water; it is yellow, amorphous or in needles; soluble in water, alcohol, ether, precipitated by tannin.

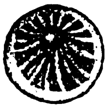
PREPARATIONS.—1. *Extractum Serpentariæ Fluidum.* Fluid Extract of Serpentaria. (Syn., Fr. Extrait liquide de Serpentaire; Ger. Flüssiges Schlangenwurz(el)-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 80 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

FIG. 93.



Serpentaria; rhizome with roots.



Rhizome; transverse section.

2. *Tinctura Serpentariæ.* Tincture of Serpentaria. (Syn., Tincture of Virginia Snakeroot; Fr. Teinture de Serpentaire; Ger. Schlangenwurzeltinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

3. *Tinctura Cinchonæ Composita,* 2 p. c. Dose, ʒj–2 (4–8 Cc.).

Unoff. Prep.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Stimulant, tonic, diaphoretic, diuretic, emmenagogue, aphrodisiac, antiperiodic; like calumba promotes appetite, digestion, increases bronchial and intestinal secretions, heart action, mental exhilaration. Large doses are irritant, causing vomiting, vertigo, colic, purging, tenesmus.

USES.—As a stimulating expectorant in typhoid pneumonia, exanthematous diseases, intermittents, dyspepsia, typhoid pneumonia, diphtheria. Fluid extract good locally against poison-oak rash.

Allied Plant:

1. *A'sarum canade'nse, Wild Ginger.*—The root (rhizome) official, 1820–1880. North America. Small plant with dividing stem; leaves 2, reniform; flowers brownish-purple, wooly; fruit capsule, 6-celled; rhizome 10 Cm. (4′) long, 3 Mm. (⅛′) thick, square or two edged, brownish, aromatic, pungent, bitterish. Contains volatile oil 1.5—3.5 p. c., resin, asarin. Used as stimulant, carminative, tonic, diaphoretic, diuretic, for whooping-cough, colic, febrile affections; in infusion, tincture, syrup. Dose, gr. 30 (2 Gm.).

25. POLYGONACEÆ. Buckwheat Family.

Pol-i-go-na'se-e. L. *Poligon-um* + aceæ, fr. Gr. *πολύς*, many, + *γόνυ*, knee, joint, from stem's numerous joints. Herbs or shrubs. Distinguished by acrid, astringent, purgative properties, stems composed of many swollen joints, with ocreate stipules above each; flowers perfect, on jointed pedicels; calyx 3–6, greenish or petaloid, inferior; ovary 1-celled, superior, styles and stigmas 2–3; stamens 6–9; fruit 3-angled, seed solitary; temperate climates; astringent, purgative; contain oxalic acid and oxalates.

Genera: 1. **Rheum.** 2. **Rumex.**

RHEUM. RHUBARB.

Rheum officinale, *Baillon.* } The root.

Habitat. W. and C. China, Thibet, Chinese Tartary.

Syn. Turkey or China Rhubarb. Br. Rhei Radix. Fr. Rhabarbarum, Rhubarbe. Ger. Radix Rheï, Rhabarberwurzel.

Rhe'um. L. Rha, the river Volga, upon whose banks it grows and was first found, fr. Gr. *ῥῆον*, *ῥεῖν*, to flow; *i. e.*, it causes purgation.

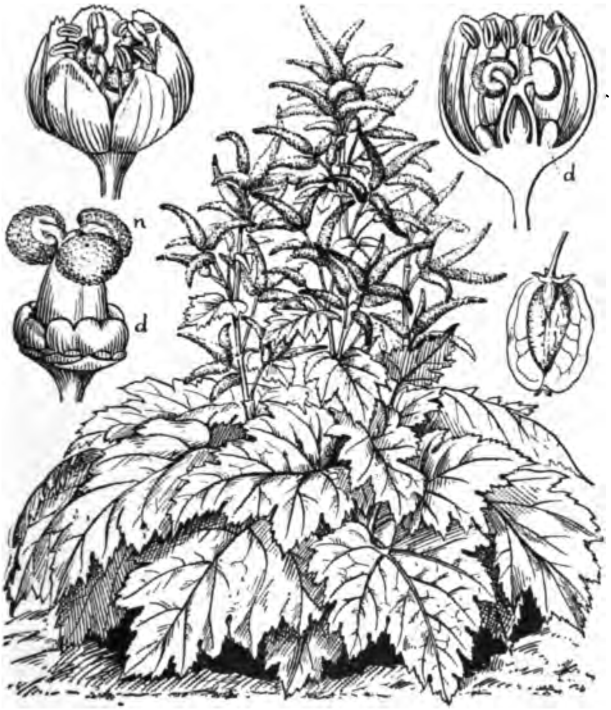
Of-fi-ci-na'le. L. *officina*, workshop; *opus*, work, + *facere*, to do; *i. e.*, used in or belonging to the shop or store.

Rhubarb, contraction of *rheubarbarum—rheum* + *barbarum; i. e.*, barbarian plant from the Rha (Volga), whence name *rha Ponticum—Pontic-rha*, *R. rhaponticum*, fr. Pontic or Euxine Sea.

PLANT.—Large, compact, perennial herb, resembling our garden rhubarb, only larger; stem after a few years, 10–15 Cm. (4–6′) thick, persistent through winters, many branches, 25–37.5 Cm. (10–15′) long, 7.5–15 Cm. (3–6′) thick, dark-brown coat from withered ocreas and leaf bases, inside fleshy, semi-pulpy, juice yellow; leaves very large, petioles .3–.5 M. (12–18′) long, 2.5–4 Cm. (1–1½′) thick, blade .6–1.3 M. (2–4°) long and wide, palmately-veined, 5–7-lobed; flowering branches (stems) 1.5–3 M. (5–10°) high, hollow, thick, green, smoothish; flowers May–June, 6 Mm. (¼′) long, in clusters of 7–10, catkin-like compound panicles, greenish-white; fruit August, in small clusters, 12 Mm. (½′) long, 6 Mm. (¼′) broad, triangular, crimson-red. ROOT, in cylindrical, conical or flattish segments, deprived of brown corky layer, smoothish or wrinkled, covered with yellowish powder, marked with white elongated meshes, containing a white spongy tissue and many reddish-yellow striæ, compact, hard, fracture uneven; internally white, with many red, irregularly-curved and interrupted medullary rays, which are radially parallel only near the cambium line; odor peculiar, aromatic; taste bitter, astringent, when chewed feels gritty and colors the saliva yellow. Pieces that are porous, or of a mucilaginous taste, or of a dark-brown interior should be rejected. *Solvents:* alcohol; water. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Irrespective of variety, rhubarb should be moderately heavy, compact, bright color, brittle, broken edges with fresh appearance, red and yellow veins intermingled with white, decidedly aromatic odor, bitter, astringent, slightly gritty, not mucilaginous, staining saliva yellow; powder bright-yellow or reddish-brown. To this turmeric is sometimes added, and also rubbed over unsightly pieces—recognized by adding to gr. 5 (.3 Gm.) of suspected rhubarb a few drops of chloroform on white paper; Chinese will slightly stain paper; European or dark colored Chinese gives deep-yellow stain; now add a few grains of borax + a drop of hydrochloric acid, when if pure rhubarb the stain will not be changed, if turmeric present get a distinct red.

FIG. 94.



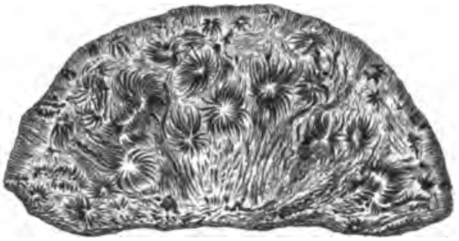
Rheum officinale; *n*, pistils and stigmas; *d*, nectar tubes.

Commercial.—Rhubarb grows wild and is cultivated extensively in Chinese Empire. A number of species furnish the root, but chiefly *R.*

officinale and *R. palmatum*. In Tartary the root is dug in spring and autumn, in China during September–October, from plants 8–10 years old; the lateral offsets and outer rind are cut off, roots divided into segments, bored with holes, threaded on strings, and suspended in shade or under cover to dry by circulating air, the curing lasting sometimes a year, thereby losing 80 p. c.—if dried by sun, ovens, or stoves root is not so firm. The plants flourish best in light, sandy soil, and while most of our supply comes from Hankow, on the Upper Yang-tse, that from Sining (Shensi rhubarb) commands the highest price. There are three important commercial varieties:

1. *Russian, Crown* (*R. palmatum*).—This is no longer on the market; it consisted of the best rhubarb trimmed to beneath the cambium, having a very large conical hole for easy inspection; it came from Chinese Tartary via Siberia. At Kiachta it was rigorously inspected, the refuse being burned and the reserved pieces sewed in linen sacks, covered with hide, and then sent to St. Petersburg. Also known as Turkey rhubarb, from the fact of the Turkish ports once supplying it, whither it was brought from Tartary by caravans through Persia and Anatolia.

FIG. 95.



Russian rhubarb; transverse section.

2. *Chinese, E. Indian* (*R. officinale, R. palmatum*, etc.).—This is our official root, has inner bark present, also sometimes patches of rough corky layer, twine fibres; color less bright and odor less aromatic than Russian. It flourishes best elevated 2,400–3,000 M. (8,000–10,000°) in the Himalaya and other mountains, on the shady side of damp ravines, with northern exposure. Exported mainly from Canton, sometimes via India.

3. *European* (*R. palmatum, R. rhaponticum, R. compactum, R. undulatum, R. Emodi* +).—Cultivated in England, France, Austria (Moravia). The roots are cut to resemble Chinese, but differ in having outside nearly or entirely without white meshes, the medullary rays interrupted, narrow, nearly straight, color paler, odor weaker, taste less gritty, more mucilaginous; not much imported. All kinds approximate two shapes, *round* and *flat*, by which they are often designated.

CONSTITUENTS.—Chrysophan 0.14 p. c., Chrysophanic acid 5 p. c., Resins (phæoretin, erythroretin, aporetin), Emodin 2 p. c., Rheïn (rheic acid, rhubarb yellow), $C_{15}H_6O_2(OH)_4$, Rheotannic acid, Rheumic acid, Calcium oxalate, starch, ash 12–14 p. c.; if bad = 35–45 p. c.

Chrysophan, $C_{27}H_{30}O_{14}$.—A glucoside with moisture, splitting into sugar and chrysophanic acid by ferments or dilute acids; it is a yellowish, bitter powder, soluble in water, alcohol, but not in ether.

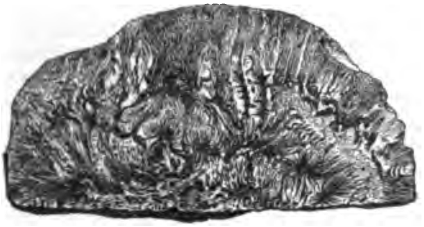
Chrysophanic Acid, $C_{15}H_8O_2(OH)_2$.—Gives most of the yellow color; obtained by treating subsiding crystals in tincture with benzene, or exhaust rhubarb with cold water, and the residue after drying with benzene, concentrate this solution when it crystallizes out in golden-yellow needles, soluble in ether, alcohol, benzene; inodorous, nearly tasteless; with alkalies deep-red.

Resins.—These are coloring principles intermediate between resin and extractive matter; *phæoretin* (brown resin), soluble in alcohol, and obtained by washing alcoholic extract with water, dissolving residue in a little alcohol, adding ether; the precipitate contains phæoretin, aporetin, and resinous matter; the liquid concentrated, gives chrysophanic acid; *erythroretin,* $C_{38}H_{36}O_{14}$ (red resin), is contained in the mother-liquor; it is tasteless, and soluble in alcohol; *aporetin* (black resin), insoluble in alcohol, with alkalies yields brown solution, with nitric acid is oxidized into oxalic and chrysamic acids.

Emodin, $C_{15}H_7O_2(OH)_3$.—Obtained by treating crude chrysophanic acid with benzene, when, being insoluble, it is left behind; it crystallizes from hot benzene in orange prisms; deep-red with alkalies, resembles chrysophanic acid.

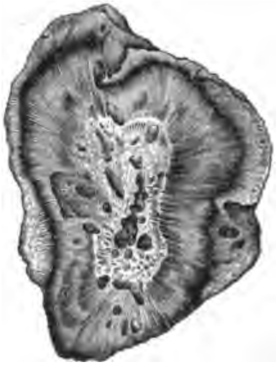
Rheotannic acid (Tannin), $C_{26}H_{26}O_{14}$.—Yellowish powder, soluble in water and alcohol, decomposed by dilute acids into sugar and rheumic acid, $C_{20}H_{16}O_9$, red, amorphous, sparingly soluble in cold water.

FIG. 96.



Chinese rhubarb; transverse section.

FIG. 97.



European rhubarb; transverse section.

Calcium Oxalate.—Causes grittiness, is present 2–40 p. c.

PREPARATIONS.—1. *Extractum Rhei.* Extract of Rhubarb. (Syn., Extractum Rhei Alcoholicum; Fr. Extrait de Rhubarbe; Ger. Rhabarber-Extrakt.)

Manufacture: Macerate, percolate with alcohol 80 p. c. Dose, gr. 3–10 (.2–.6 Gm.).

2. *Extractum Rhei Fluidum.* Fluid Extract of Rhubarb. (Syn., Fr. Extrait liquide de Rhubarbe; Ger. Flüssiges Rhabarber-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 80 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Preps.: 1. *Mistura Rhei et Sodæ.* Mixture of Rhubarb and Soda. (Syn., Fr. Potion à la Rhubarbe Alcaline; Ger. Alkalische Rhabarbermixtur.)

Manufacture: Fluid extract of rhubarb 1.5 Cc., fluid extract of ipecac .3, sodium bicarbonate 3.5 Gm., glycerin 35 Cc., spirit of peppermint 3.5, water q. s. 100 Cc. Dose, ʒij–16 (8–60 Cc.).

2. *Syrupus Rhei.* Syrup of Rhubarb. (Syn., Fr. Sirop de Rhubarbe; Ger. Rhabarbersirup (saft).)

Manufacture: Fluid extract of rhubarb 10 Cc., spirit of cinnamon .4, potassium carbonate 1 Gm., glycerin 5 Cc., water 5, syrup q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

3. *Pilulæ Rhei.* Pills of Rhubarb. (Syn., Fr. Pilules de Rhubarbe; Ger. Rhabarberpillen.)

Manufacture: Rhubarb 20 Gm., soap 6, water q. s. 100 pills. Dose, 1–5 pills.

4. *Pilulæ Rhei Compositæ.* Compound Pills of Rhubarb. (Syn., Fr. Pilules de Rhubarbe Composées; Ger. Rhabarber und Aloepillen.)

Manufacture: Rhubarb 13 Gm. purified aloes 10, myrrh 6, oil of peppermint, .5, water q. s. 100 pills. Dose, 1–5 pills.

5. *Pulvis Rhei Compositus.* Compound Powder of Rhubarb. (Syn., Gregory's Powder, Powder Magnesia and Rhubarb, Pulves (Infantum) Antacidus; Fr. Poudre de Rhubarbe Composée; Ger. Kinderpulver.)

Manufacture: 25 p. c. Rhubarb 25 Gm., magnesia 65, ginger 10. Dose, ʒss–1 (2–4 Gm.).

6. *Tinctura Rhei.* Tincture of Rhubarb. (Syn., Fr. Teinture de Rhubarbe; Ger. Rhabarbertinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. + cardamom 2, with glycerin 10 Cc., alcohol 60, water 30, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ʒss–4 (2–15 Cc.).

7. *Tinctura Rhei Aromatica.* Aromatic Tincture of Rhubarb. (Syn., Fr. Teinture de Rhubarbe Aromatique; Ger. Aromatische Rhabarbertinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. + cassia cinnamon 4, cloves 4, nutmeg 2, with glycerin 10 Cc., alcohol 50, water 40, finishing with diluted alcohol, q. s. 100 Cc. Dose, ʒss–4 (2–15 Cc.).

Prep.: *Syrupus Rhei Aromaticus.* Aromatic Syrup of Rhubarb. (Syn., Spiced Syrup of Rhubarb; Fr. Sirop de Rhubarbe Aromatique; Ger. Gewürzter Rhabarbersaft.)

Manufacture: Aromatic tincture of rhubarb 15 Cc., syrup 85. Dose, for a child with diarrhœa, ʒj–2 (4–8 Cc.).

8. *Tinctura Rhei Dulcis.* Sweet Tincture of Rhubarb. (Syn., Fr. Teinture de Rhubarbe douce; Ger. Süsse Rhabarbertinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. + glycyrrhiza 4, anise 4, cardamom 1, with glycerin 10 Cc., alcohol 50, water 40, finishing with diluted alcohol q. s. 100 Cc. Dose, ʒij–4 (8–15 Cc.).

Unoff. Preps.: Vinum, 10 p. c. Dose, ʒj–4 (4–15 Cc.). *Infusion,* 5 p. c. Dose, ʒiv–8 (15–30 Cc.). *Aromatic Fluid Extract,* ♏xv–60 (1–4 Cc.).

PROPERTIES.—Aperient, purgative, astringent, stomachic, tonic. It increases saliva, gastric juice, bile, peristalsis, vascularity and absorption. The cathartic effect comes first (4–8 hours), due to resins, probably phæoretin; then follows astringency from rheotannic acid; both actions being chiefly on the duodenum. The milk, urine, and sweat become colored, the first also acquiring bitterness and purgative properties. Purgation may result from its application to ulcers, abraded skin or in poultices to abdomen.

USES.—Diarrhœa, hemorrhoids, cholera infantum, chronic dysentery, dyspepsia, thread worms. With calomel good in bilious fevers; with magnesia for stomach and bowel disorders. By association with other cathartics both are rendered more efficient; sometimes used with opium.

Allied Plants:

1. *R. rhapo'nticum*, Asia Minor, Siberia, Russia.—This is cultivated as pie-plant; the leaf petioles being used, as they possess pleasant acidulous properties; this species is the source of the cultivated European root, and that of Moravia (Austria), Hungary, England, and Banbury.

2. *R. palma'tum* (cultivated in Germany, France, Russia), *R. undula'tum*, *R. compa'ctum*, *R. Emo'di*, *R. austra'le*, *R. hy'bridum.*—All produce handsome, but smaller, less valuable and lighter-colored roots.

Torrefied Rhubarb.—By roasting the cathartic principle is volatilized and the full astringency left intact; long boiling will effect the same.

RUMEX. RUMEX (YELLOW DOCK).

Rumex crispus, *Linné,* } The root.
and other species.

Habitat. Europe, naturalized in N. America, in grassy places and along roadsides.
Syn. Curled, Sour or Narrow Dock, Garden Patience, Radix (Rumicis) Lapathi.
Fr. Racine de Patience frisée. Ger. Grindwurz(el), Mengelwurz.
Ru'mex. L. sorrel, fr. *rumex*, a kind of lance; *i. e.*, from the shape of the leaves.
Cris'pus. L. curled, wrinkled; *i. e.*, radical leaves curled on the margin.

PLANT.—Compact perennial, springing from a fusiform, yellow root, which penetrates far into the ground; stem rises annually 1–1.3 M. (3–4°) high; leaves lanceolate, smooth, margins strongly wavy-curled, acute, the lower strongly petiolate, subcordate at base; flowers June, greenish, leafless above, wand-like racemes. ROOT, 10–30 Cm. (4–12′) long, 6–18 Mm. (¼–¾′) thick, fusiform, fleshy, nearly simple, annulate above, deeply wrinkled below, rusty-brown; internally whitish, with fine, straight, interrupted, reddish medullary rays; bark rather thick, fracture short; odor slight, peculiar; taste bitter, astringent. *Solvents:* diluted alcohol; boiling water (injured by long boiling). Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Chrysophanic acid, (rumicin, lapathin), tannin, calcium oxalate, starch, mucilage.

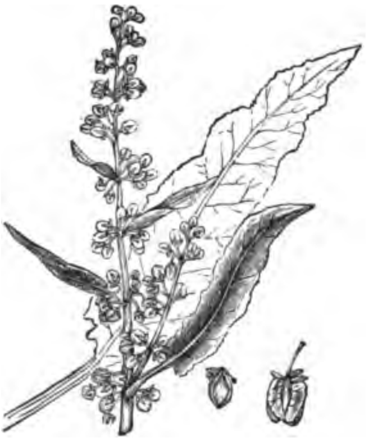
PREPARATIONS.—1. *Extractum Rumicis Fluidum.* Fluid Extract of Rumex. (Syn., Fluid Extract of Yellow Dock; Fr. Extrait liquide de Patience frisée; Ger. Flüssiges Grindwurz-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 5–15 (.3–1 Gm.). *Decoction,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Ointment. Cataplasm.*

PROPERTIES.—Astringent, alterative, tonic, laxative, antiscorbutic. Similar to rhubarb and sarsaparilla.

FIG. 98.



Rumex crispus.

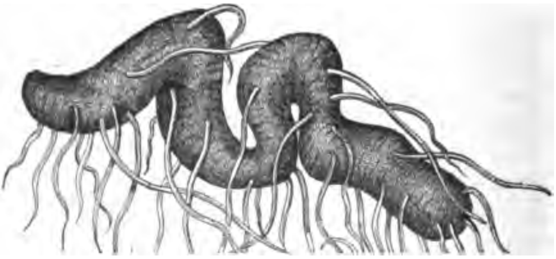
USES. — Cutaneous eruptions, scorbutic troubles, itch, scrofula, syphilis, hepatic congestion, dyspepsia, intermittents. Generally used in decoction or ointment; for skin diseases, swellings, scabies, etc. Ointment may be made from powder, or acetous extract with lard and sulphur. The leaves are laxative; furnish a good diet in scorbutic cases. Contain considerable oxalic acid, and when young used as spinach.

Allied Plants:

1. *R. brita'nnica, Water Dock.*—The root official, 1820–1860, Europe, naturalized in N. America. Plant 1.6–2 M. (5–6°) high, leaves lanceolate, acute, transversely veined, obscurely crenate, .3–.6 M. (1–2°) long; root more astringent but physically and medicinally similar to the official, with which it is often indiscriminately collected.

2. *R. obtusifo'lius, Broad-leaved Dock.*—The root official, 1820–1860. Europe, naturalized in N. America. Common obnoxious weed .6–1 M. (2–3°) high, leaves 15–30 Cm. (6–12′) long, 7.5–10 Cm. (3–4′) wide, sometimes red-veined, ovate, heart-shaped, downy, wavy margins, acuminate; roots similar to official, with which it is often indiscriminately collected, both alike medicinally.

FIG. 99.



Polygonum Bistorta; rhizome, natural size.

3. *R. sangui'neus, Red-veined Dock.*—Leaf-veins and stems reddish. *R. aqua'ticus,* fruit smooth, both astringent. *R. Acetose'lla, Field* or

Sheep Sorrel, contains acid potassium oxalate and tartaric acid, sour taste lost upon drying; refrigerant, diuretic, good diet in scurvy.

4. *Poly'gonum Bisto'rta, Bistort.*—Europe, Asia, N. America, in meadows. Produces an S-shaped rhizome, bent upon itself—bistorted, 5 Cm. (2′) long, 15 Mm. ($\frac{3}{5}'$) thick, flattened or channelled, upper side transversely striate, root-scars on under side, red-brown; contains tannin 20 p. c., starch, calcium oxalate; tonic, astringent. Dose, gr. 5–30 (.3–2 Gm.).

26. CHENOPODIACEÆ. Goosefoot Family.

Ke-no-po-di-a′se-e. L. *Chenopodi-um* + aceæ, fr. Gr. *χήν*, goose, + *πούς*, foot, referring to the shape of leaves. Herbs, shrubs. Distinguished by being homely, succulent; leaves exstipulate, no bracts; flowers minute, greenish, with free calyx imbricated in the bud, persistent; 2–5-lobed; petals none; ovary 1-celled, forming 1-seeded utricle; universal, saline places; anthelmintic, antispasmodic, aromatic, carminative, stimulant (vol. oil).

Genus: 1. **Chenopodium.**

CHENOPODIUM. CHENOPODIUM (AMERICAN WORMSEED).

Chenopodium { **ambrosioides,** *Linné,*
anthelminticum, *Linné.* } The fruit.
(**C. ambrosioides** var. **anthelminticum,** *Gray.*)

Habitat. W. Indies, C. and S. America, waste places, roadsides. Naturalized in United States, Europe, Africa. Cultivated in Maryland for the oil.

Syn. Wild Wormseed, Stinking Weed, Jerusalem or Jesuit Tea, Jerusalem Oak or Jak, Goosefoot, Wormseed Plant, Fructus Chenopodii Anthelmintici; Fr. Anserine Vermifuge (plante fleurie); Ger. Amerikanischer Wurmsamen.

Che-no-po′di-um. L. see etymology, above, of Chenopodiaceæ.

Am-bro-si-oi′des. L. fr. Gr. *a*, priv., not, + *βροτός*, mortal, + *ο-είδης*, like; *i. e.*, resembling that which is immortal, once thought to effect that condition when taken.

An-thel-min′ti-cum. L. fr. Gr. *ἀντί*, against, + *ἕλμινθα*, a worm; *i. e.*, worm antagonizer or destroyer.

PLANT.—Annual or perennial, .6–1.6 M. (2–5°) high; stem angular, furrowed and branched; leaves toothed, yellowish-green, gland-dotted on under surface; flowers, July–Sept., greenish-yellow, dense leafy spikes; FRUIT, 2 Mm. ($\frac{1}{12}'$) thick, size of pin's head, depressed-globular, greenish-gray, integuments friable, containing a lenticular, obtusely-edged, glossy, black seed; odor peculiar, terebinthinate; taste bitter, pungent. All parts of the plant have this disagreeable odor and medicinal properties, both dry and fresh. It grows best in rubbish, along fences, in village streets, vacant lots, and should be collected in October. *Solvents:* diluted alcohol; boiling water. Dose, gr. 15–30 (1–2 Gm.).

ADULTERATIONS.—Fruit of allied species, having like properties.

Commercial.—The differences between *C. ambrosioides* and *C. anthelminticum* (*C. ambrosioides* var. *anthelminticum*) are very slight, consisting in the latter being more strongly aromatic, leaves more deeply toothed, the lower ones often nearly pinnatifid, spikes more elongated, mostly leafless; fruit of both alike. The former is known in Europe as Herba Botryos Mexicanæ. Mexican tea.

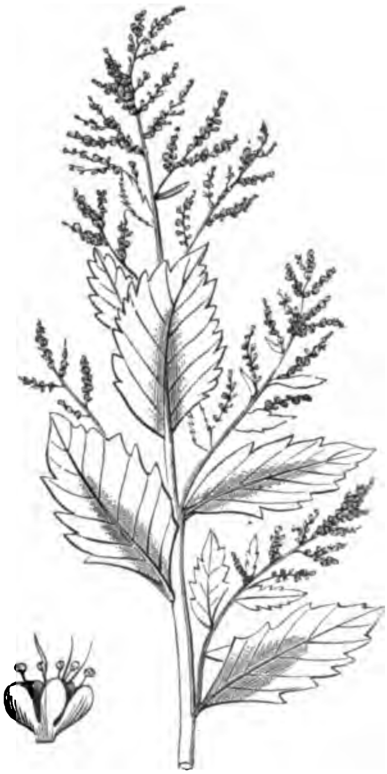
CONSTITUENTS.—Volatile oil, 3–3½ p. c., ; from fresh herb ½–1 p. c.

Oleum Chenopodii. Oil of Chenopodium, *official*.—(Syn., Oil of American Wormseed; Fr. Essence de Chénopode Anthelmintique: Ger. Chenopodiumöl, Amerikanisches Wurmsamenöl.)

This volatile oil, obtained by distilling chenopodium with water or superheated steam, is a thin, yellowish liquid, with characteristic camphoraceous odor, pungent, bitter taste; sp. gr. 0.970, boils at 180° C. (365° F.); consists of hydrocarbon, $C_{10}H_{16}$, and liquid oxygenated oil, $C_{10}H_{16}O$. *Test:* 1 Cc. + 10 Cc. of alcohol 75 p. c. should form a clear solution. It should be kept cool, in well stoppered bottles. Dose, ♏ij–10 (.13–.6 Cc.).

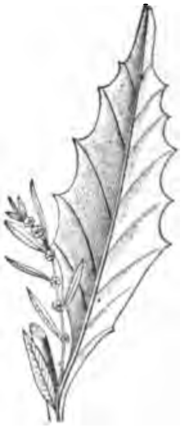
PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ♏xv–30 (1–2 Cc.). *Decoction* (water or milk). Dose, ℥j–2 (30–60 Cc.). *Expressed Juice* (fresh plant). Dose, ʒij–4 (8–15 Cc.) ter die.

FIG. 100.



Chenopodium anthelminticum. (C. ambrosioides var. anthelminticum.)

FIG. 101.



Chenopodium ambrosioides.

PROPERTIES.—Anthelmintic, vermifuge, round worms (*Ascaris lumbricoides*).

USES.—While mainly for worms, it has also been used in intermittents, hysteria, chorea, nervous affection, tænia. Can give the powder incorporated with molasses or syrup, but the oil is most popular and is well taken on sugar by children. Should be given twice daily for several days, on empty stomach if possible, and follow with a dose of castor oil.

Allied Plants:

1. *C. Bo′trys, Jerusalem Oak* (*Feather Geranium*).—Europe, Asia. Strongly aromatic; catarrh, asthma. *C. Bo′nus-Henri′cus, Good King Henry.* Europe. Taste saline, mucilaginous. *C. a′lbum, Pig Weed* (*Lamb's Quarters*). Taste mucilaginous, saline. *C. Vulva′ria, Fetid Goosefoot.* Europe. Plant has fishbrine odor, due to trimethylamine.

27. PHYTOLACCACEÆ. Pokeweed Family.

Fi-to-la-ka′se-e. L. *Phytolacc-a* + aceæ, fr. Gr. φυτόν, plant, + It. *lacca*, lake color, red, alluding to crimson juice of the berries. Herbs, shrubs. Distinguished by possessing acrid principle; leaves entire; flowers perfect, 4–5's, petals none, ovary superior, several-celled, composed of as many carpels united in a ring, each with undivided style, forming a berry fruit, otherwise like Chenopodiaceæ; temperate climates, tropics; emetic, purgative, acrid principle destroyed by boiling water.

Genus: 1. **Phytolacca.**

PHYTOLACCA. POKE.

1. PHYTOLACCÆ FRUCTUS. Phytolacca Fruit.
2. PHYTOLACCÆ RADIX. Phytolacca Root (Poke Root).

Phytolacca decandra, *Linné.* } The fruit and root.

Habitat. N. America, in waste places, naturalized in S. Europe, W. Indies.

Syn. Red Weed, Garget, Pocan, Bush, Cancer Jalap, American Nightshade, Scoke, Skoke, Coakum, Red Ink Plant or Berries, Pigeon Berry, Virginia Poke (Phytolaccæ Bacca, Poke Berry, U. S. P., 1880). Fr. Agouman, Morella à grappes, Raisin d'Amérique, Racine de Phytolaque. Ger. Kermesbeere, Amerikanische Kermesbeere, Kermesbeerenwurzel.

Phy-to-lac′ca. L. see etymology, above, of Phytolaccaceæ.

De-can′dra. L. fr. Gr. *δέκα*, ten, + *ανδρός*, stamen; *i. e.*, flowers have ten stamens.

Poke, corruption of *Pocan*, its former Virginia name.

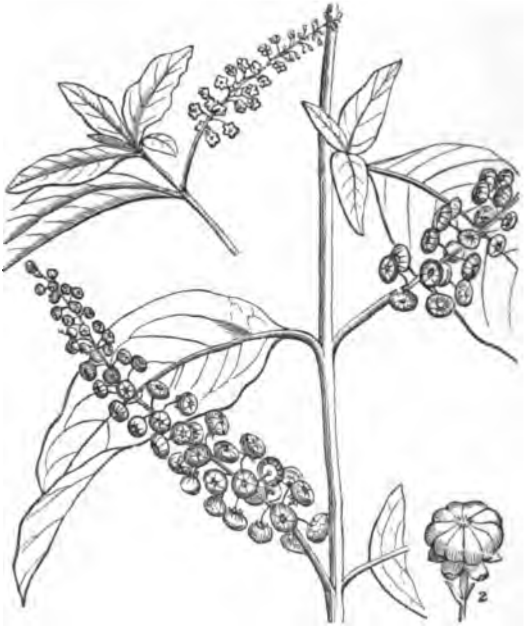
PLANT.—Perennial herb; stem annual, purplish, hollow, 1.3–2.5 M. (4–8°) high, 2.5–5 Cm. (1–2′) thick, smooth, branching; leaves 12.5 Cm. (5′) long, 5–7.5 Cm. (2–3′) wide, smooth, rich-green, entire, petioled, ovate, both ends acute; flowers June, greenish-white, racemes. FRUIT, Aug., at first green, then purplish-black, depressed-globular, compound berry, 8 Mm. (⅓′) thick, composed of 10 carpels, each with one lenticular black seed, juice purplish-red; inodorous; taste sweet, acrid, when clusters dried resemble grapes or raisins. Dose, gr. 5–15 (.3–1 Gm.). ROOT, large, conical, branched, fleshy, 2.5–10 Cm. (1–4′) thick, mostly in transverse or longitudinal slices, wrinkled, grayish, hard, fracture fibrous, wood-bundles in several distinct concentric circles; inodorous; taste sweetish, acrid, bark and cork thin. Collect both fruit and root in August. *Solvents:* alcohol; diluted alcohol; boiling water. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—ROOT: Occasionally, to a limited extent, with inula, rumex, podophyllum, etc.

CONSTITUENTS.—I. FRUIT: Phytolaccic acid, coloring matter (bleached by sunlight, yellow by alkalies), sugar, gum.

Phytolaccic Acid.—Amorphous, acrid, brownish, soluble in water, sparingly in alcohol, chloroform, ether, glycerin, precipitated by lead subacetate.

FIG. 102.

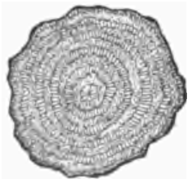


Phytolacca decandra; 2, single fruit, showing carpels.

II. ROOT: Resin 1 p. c., fixed oil and wax .6 p. c., sugar 10 p. c., proteids 2 p. c., asparagin 1.6 p. c., starch 11.7 p. c., gum, coloring matter, ash 8–10 p. c. (mostly calcium oxalate and nitrate). Some think resin, etc., not the active constituents, but these to be phytolaccine, phytolaccin, and phytolaccic acid; yet none of these respond to the characteristic tests of an alkaloid, neutral principle or an acid in the separate state. The "Eclectic" resinoid, phytolaccin, is soluble in alcohol. Dose, gr. 1–3 (.06–.2 Gm.).

PREPARATIONS.—1. *Extractum Phytolaccæ Radicis Fluidum.* Fluid Extract of Phytolacca Root. (Syn., Fluid Extract of Poke Root; Fr. Extrait liquide du Racine de Phytolaque; Ger. Flüssiges Kermesbeerenwurzel Extrakt.)

FIG. 103.



Phytolacca root; transverse section, natural size.

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Unoff. Preps.: FRUIT: *Fluid Extract.* Dose, ♏xv–30 (1–2 Cc.). *Tincture, Infusion, Expressed Juice.* ROOT: *Decoction,* 5 p. c. Dose, ʒiv–8 (15–30 Cc.). *Tincture,* 10 p. c. (diluted alcohol). Dose, ♏x–60 (.6–4 Cc.). *Ointment* (fld. extr. of root or leaves 1 + 8 lard). *Decoction* and *Fresh Juice of Leaves* are also used.

PROPERTIES.—Alterative, laxative, emetic, anodyne, resolvent, paralyzes spine and muscles of respiration, death preceded by tetanic convulsions. Overdose (ʒij–4; 8–15 Gm.) produces in two hours vomiting, purging, thirst, prostration, cold skin, feeble pulse, vertigo, dim vision, coma, convulsions, death ; similar to veratrum, except the vomiting is usually delayed.

USES.—Rheumatism, skin diseases, syphilis. Internally and externally for ulcers, scabies, tinea capitis, eczema, sycosis, mange in dogs, tonsillitis, diphtheria, pharyngitis, glandular conjunctivitis, scrofula, hemorrhoids. May prevent mastitis (gathered breasts).

Poisoning: Same as for aconite, veratrum.

Incompatibles: Cardiac stimulants, opium.

Synergists: Cardiac sedatives, motor depressants, emetics.

Allied Plants:

1. *P. octa'ndra,* C. and S. America, and *P. acino'sa,* N. India, are used similarly. These and the official furnish young shoots which in spring can be eaten for asparagus, spinach, etc., imparting no odor to urine, but when old none can be taken except in medicinal doses.

28. MAGNOLIACEÆ. Magnolia Family.

Mag-no-li-a'se-e. L. *Magnoli-a* + aceæ, after Pierre Magnol, Professor of Botany at Montpellier, France (1638–1715). Trees or shrubs; leaves leathery, pellucid-punctate, stipulate; flowers large, sweet-scented, white or red, distinct, except the many pistils cohere; sepals 3, and petals 3–12, colored alike, in 3 or more rows of three each, imbricate; stamens many; fruit aggregate, cone-like, stellate, or capsular; seed albuminous, superior; temperate climates, tropics; bitter, tonic, aromatic.

Genus: 1. **Illicium.**

ILLICIUM. ILLICIUM (STAR ANISE).

Illicium verum, *Hooker filius.* } The fruit.

Habitat. N. Anam (high mountains of Yunnan in S. W. China, and to the west of Canton, entering commerce mostly through the port of Pakhoi). Cultivated.

Syn. Chinese Anise. Semen Badiani. Badiane. Br. Anisi Stellati Fructus. Fr. Anise étoilé. Ger. Sternanis.

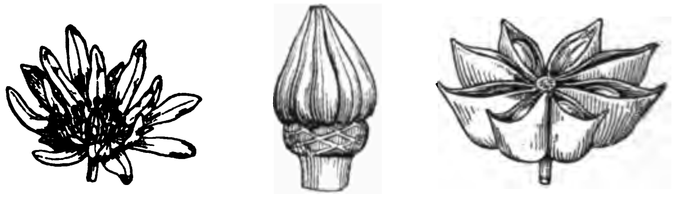
Il-li'ci-um. L. an allurement; *i. e.,* from its odor and attractive appearance.

Ve'rum. L. *verus,* true; *i. e.,* the genuine or real type.

PLANT.—Small tree, 3–6 M. (10–20°) high, branched, young twigs spotted brown; leaves evergreen, lanceolate, pointed, entire, pellucid-punctate, 5–15 Cm. (2–6′) long; flowers Jan.–April, greenish-yellow. FRUIT (consisting of capsular integuments 78 p. c. and seeds 22 p. c.), pedunculate, composed of 8 stellately arranged carpels, boat-shaped, 8 Mm. (⅓′) long, woody, wrinkled, straight-beaked, brown, dehiscent on upper suture; internally, each carpel reddish-brown, glossy, containing one flattish, oval, glossy-brown seed; odor anise-like (*anisa'tum*); taste of the carpels sweet, aromatic, and of the seeds oily. *Solvents:* alcohol; hot water partially. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATION.—Mostly with its allied fruit of *Illicium religiosum* (*anisatum*), from which it must be guarded with much care, as it is poisonous.

FIG. 104.

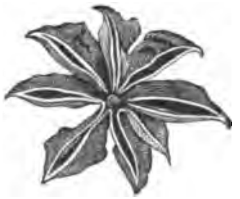


Illicium verum; *a*, flower; *b*, fruit carpels of the flower magnified; *c*, fruit.

CONSTITUENTS.—Capsules: Volatile oil 5.3 p. c., resin 10.7 p. c., fixed oil 2.8 p. c., saponin, protocatechuic acid, shikimic acid, $C_7H_{10}O_5$ (crystalline, non-poisonous), mucilage, ash 2 p. c.; Seeds: Volatile oil 1.8 p. c., resin 2.6 p. c., fixed oil 20 p. c.

Volatile Oil.—Obtained by distillation with water or steam. It is almost identical with oil from *Pimpinella Anisum* in odor, taste, composition, but congeals at a lower temperature (1° C.; 34° F.); acquires a pale-brown color with alcoholic solution of hydrochloric acid; sp. gr. 0.985, and consists chiefly of anethol, $C_{10}H_{12}O$, with small amounts of pinene, phellandrene, safrol, and the ethel ether of hydroquinone. It is mostly distilled in its native country, whence it enters market in tin-lined vessels. Dose, ♏j–5 (.06–.3 Cc.), on sugar or in emulsion.

FIG. 105.



Illicium religiosum (anisatum).

PREPARATION.—(Unoff.) *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Carminative, anodyne, stimulant, diuretic.

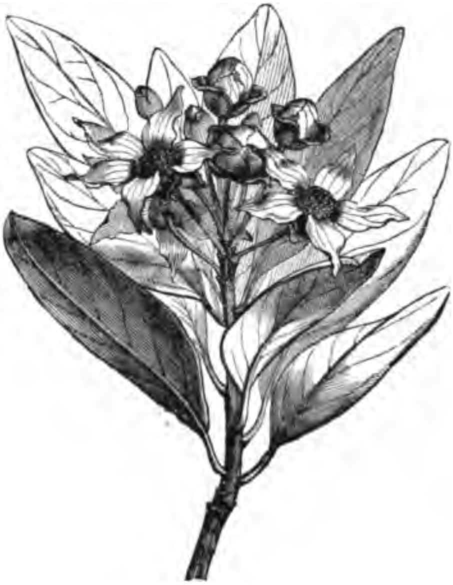
USES.—Flatulent colic, indigestion, infantile catarrh, bronchitis, flavoring culinary products, cordials, elixirs, spirits, medicines. Externally: painful colic, rheumatism, earache. Oil used mostly instead of and to adulterate official anise oil.

Allied Plants:

1. *I. religio'sum* (*anisa'tum*).—Cultivated around Buddhist temples in China and Japan, being called *Shikimi*. Fruit very similar to official, having 8 carpels, more woody, shriveled, thin, upward-curved beak; odor faint, clove-like; taste unpleasant. This contains 0.44 p. c. of non-solidifying volatile oil, sp. gr. 0.990, shikimic acid, sikimipicrin (crystalline, bitter) and sikimin (poisonous). The oil

contains a terpene, safrol, $C_{10}H_{10}O_2$, eugenol, $C_{10}H_{12}O_2$, and liquid anethol. The fruit is used natively for killing rats, fish, etc., the latter serving as food in spite of the poison. Upon persons it causes vomiting, epileptiform convulsions and dilated pupils; *I. florida'num* and *I. parviflo'rum*. Fla., Ga., La.; the former has fruit with 13 carpels, the latter with only 8; barks are sometimes substituted for cascarilla.

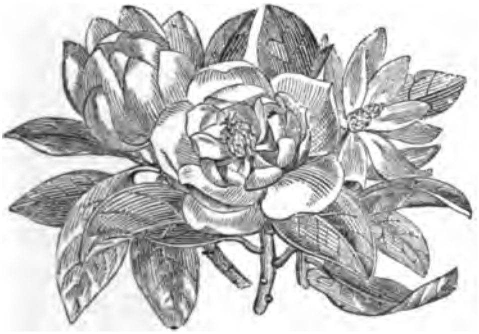
FIG. 106.



Drimys Winteri.

2. *Dri'mys Winte'ri* (*Winte'ra aroma'tica*).—The bark official, 1820–1860; S. America; small tree; leaves coriaceous; flowers white; fruit black berries, 4–8; bark in quills or curves, 2.5–8 Mm. ($\frac{1}{10}$–$\frac{1}{3}$′) thick, grayish-brown, striate, fracture granular, with white stone-cells and yellow resin-cells, odor of canella and cinnamon, for which drugs it has been substituted; sometimes called Winter's cinnamon. Contains volatile oil (which has winterene, $C_{15}H_{24}$), tannin 9 p. c., pungent resin 10 p. c. Used for colic, flatulence, scurvy; in infusion or tincture. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 107.



Magnolia acuminata.

3. *Magno'lia virginia'na* (*glau'ca*), *M. acumina'ta* and *M. tripe'tala*. — The bark official, 1820–1890; United States; trees 6–28 M. (20–90°) high; flowers white, fragrant; fruit cones; bark in thin quills or curved pieces, orange-brown, glossy, warty, fissured, astringent, bitter. Contains volatile oil, resins, magnolin, tannin. Used for malaria, rheumatism, gout, intermittents, catarrhs; in decoction, infusion, tincture. Dose, ʒss–1 (2–4 Gm.).

4. *Liriode'ndron Tulipi'fera, Tulip-tree.*—The bark, official, 1820–1880; United States, China; tree 18–45 M. (60–150°) high; flowers yellowish; fruit cone, 7.5 Cm. (3′) long. Bark in quills or curved

pieces 2 Mm. ($\frac{1}{12}$′) thick, purplish-brown, thin ridges, inside whitish, smooth, astringent. Contains volatile oil, resins, liriodendrin, tulipiferine, tannin; injured by boiling. Used for chronic rheumatism, dyspepsia, intermittent fever; in infusion or fluid extract. Dose, ʒss–1 (2–4 Gm.).

29. MYRISTICACEÆ. Nutmeg Family.

Mi-ris-ti-ka′se-e. L. *Myristic-a* + aceæ, fr. Gr. *μυρίζειν*, to anoint; *i. e.*, an ointment used for its sweet odor. Trees. Distinguished by aromatic properties; leaves dotted, entire, stalked, leathery; flowers regular, diœcious, calyx 3–4-cleft, leathery, inferior; filaments 3–12, united, ovary 1-celled, ovule 1; fruit succulent, seed oily; tropics; aromatic, seeds the strongest; bark and pericarp acrid.

Genus: 1. **Myristica.**

MYRISTICA. NUTMEG.

Myristica fragrans, *Houttuyn.* } The seed deprived of its testa.

Habitat. Molucca Islands, cultivated in tropics, India, Philippine Islands, S. America, Ceylon, Sumatra, Java, etc.

Syn. Fr. Nux Moschata, Muscade, Noix Muscade. Ger. Semen Myristicæ. Muskatnuss.

My-ris′ti-ca. L. see etymology, above, of Myristicaceæ.

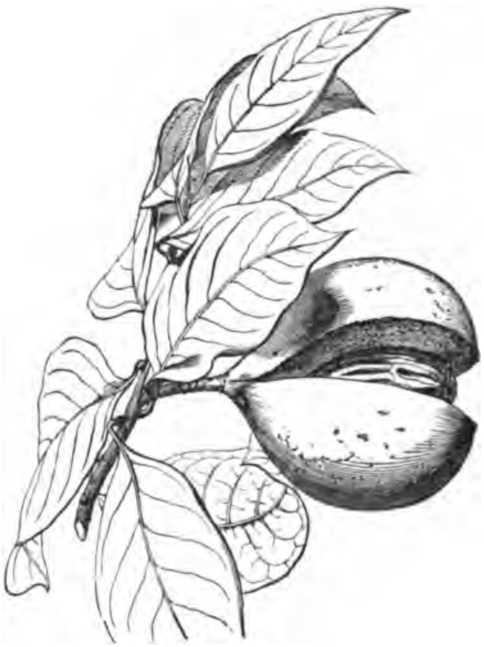
Fra′grans. L. *fragran*(*t*)*s*, sweet scented; *i. e.*, from its fragrant odor.

Nut′meg. OE. *nut* + *muge*, musk, corrupt. into *meg*; *i. e.*, from its odor.

Plant.—Evergreen tree 7.5–15 M. (25–50°) high, much branched, bark brownish-gray, smooth, young branches green; leaves leathery, smooth, entire, 10–15 Cm. (4–6′) long, acute at both ends, prominently veined, dark-green; flowers diœcious, small, yellow; fruit pendulous, smooth, yellow, 7.5 Cm. (3′) long, 5 Cm. (2′) wide, resembling a pear, but grooved by a longitudinal furrow, pericarp 12 Mm. (½′) thick, tough, fleshy, with astringent juice, yellowish-white, dehiscing from above along the furrow into two equal valves, which when ripe becomes dry, coriaceous, and from between these readily falls out an erect, single seed. Seed, 3 Cm. (1¼′) long, 18 Mm. (¾′) thick, ovoid, blunt, closely enveloped and almost completely covered by an irregularly cut, fleshy arillus (mace). When deprived of this, the seed-testa is dark-brown, hard, thick, smooth, shining, woody, reticulately furrowed from the tightly appressed arillus; inner seed-coat thin, membranous, pale-brown; nucleus (nutmeg) wrinkled, circular scar and embryo on the broad end, consisting of the abundant endosperm, rather soft, but firm, whitish, marbled with numerous reddish-brown vein-like partitions into which the inner seed-coat penetrates (ruminated); fatty lustre, strongly aromatic, bitter. Some treat the hard testa and kernel as the seed, like peach seed, but the U. S. P. recognizes solely (the kernel or nucleus) that central part left, after the fleshy portion, arillus, and hard testa have been removed. *Solvents:* alcohol; ether. Dose, gr. 5–20 (.3–1.3 Gm.).

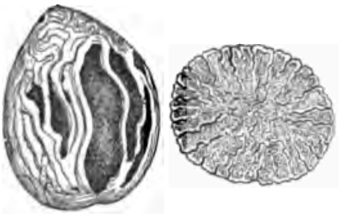
Commercial.—Nutmeg trees prefer light soil, shade and moist climate. They produce fruit when 8–9 years old, are matured at 25, and yield annually for 60–70 years; the fruit is collected Sept.–Dec. and April–June (when it has split on one or both sides), by means of a hook on long poles or by hand in a basket; the pericarp and arillus are removed and seed dried by sun or fire at 60° C. (140° F.), being spread on frames for two months and turned over every few days. When kernels rattle in their shells these latter are cracked off with mallets, kernels are then assorted, and the best rubbed over with powdered lime; they are packed in whitewashed casks for market. The Chinese are supplied with uncracked seed; while inferior grades are used for expressing the oil. We have several varieties: 1. *Unlimed, Penang, Singapore,* as above described, sometimes oily to touch and mixed with cloves.

FIG. 108.



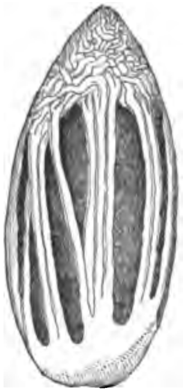
Myristica fragrans, twig with the fruit.

FIG. 109.



Nutmeg, with mace, and transverse section.

FIG. 110.



Wild nutmeg, with mace.

2. *Limed, Dutch.* Prepared in the Banda Islands by dipping dried seed into a mixture of salt water and lime (as a protection against insect

attacks, and possibly to kill the embryo, thus limiting their culture to their own provinces), then exposing to sun several days, and packing for market. The ancients were unacquainted with this drug, Avicenna being the first to notice it.

Constituents.—Volatile oil 2–8 p. c. Fixed oil 25–30 p. c., starch, proteids, mucilage, ash 2 p. c.

Oleum Myristicæ. Oil of Nutmeg, *official.*—(Syn., Oleum Nucistæ Æthereum ; Fr. Essence de Muscade ; Ger. Ætherisches Muskatöl.)

This volatile oil, obtained by distilling nutmeg with water or steam, is a pale-yellowish liquid with characteristic nutmeg odor, warm, spicy taste, darkens and thickens with age, sp. gr. 0.885, soluble in equal volume of alcohol or glacial acetic acid ; contains chiefly pinene, probably some dipentene, also myristicol, $C_{10}H_{16}O$, and myristicin, $C_{12}H_{14}O_3$. The nutmeg camphor (formerly thought to be myristin), which sometimes settles upon standing, is myristic acid. Dose, ♏ij–3 (.13–.2 Cc.).

Fixed Oil. (Oleum Myristicæ Expressum.)—Obtained by expression, often improperly called *oil of mace,* is an orange-brown solid, sp. gr. 0.995, melting at 45° C. (113° F.), soluble in 2 parts hot ether, 4 hot alcohol ; consists mainly of myristin, with some myristic acid, palmitin, olein, resin, volatile oil 6 p. c. Dose, gr. 2–5 (.13–.3 Gm.).

Preparations.—I. Seed : 1. *Acetum Opii,* 3 p. c. Dose, ♏v–20 (.3–1.3 Cc.).

2. *Pulvis Aromaticus,* 15 p. c. Dose, gr. 10–30 (.6–2 Gm.).

3. *Tinctura Lavandulæ Composita,* 1 p. c. Dose, ʒss–1 (2–4 Cc.).

4. *Tinctura Rhei Aromatica,* 2 p. c. Dose, ʒss–4 (2–15 Cc.).

5. *Trochisci Sodii Bicarbonatis,* gr. $\frac{1}{8}$ (.01 Gm.) in each. Dose, 1–3 troches.

II. Oil : 1. *Spiritus Myristicæ.* Spirit of Nutmeg. (Syn., Essence of Nutmeg ; Fr. Alcoolat (Esprit) de Muscade ; Ger. Muskatspiritus.)

Manufacture : 5 p. c. Dissolve 5 Cc. in alcohol 95. Dose, ʒj–2 (4–8 Cc.).

Properties.—Stimulant, stomachic, narcotic, flavoring, condiment, increases gastric juice, digestion, appetite ; large doses, like camphor, act on the cerebrum, causing stupor, delirium.

Uses.—Flatulence, carminative, diarrhœa, dysentery, vomiting, colic, dyspepsia.

Allied Products :

1. *False Nutmegs, M. fa'tua, Long, Wild* or *Male Nutmegs.*—4–5 Cm. (1½–2′) long, kernel paler, less aromatic than the official.

2. *Torre'ya califo'rnica, California Nutmegs,* Pinaceæ.—Testa smooth, brittle, kernel oblong, marbled, terebinthinate odor and taste.

MACIS. MACE.

Myristica fragrans, *Houttuyn.* } The arillode of the seed.

Syn. Arillus Myristicæ. Fr. Fleur de Muscade. Ger. Muskatblüthe.

Ma'cis. L. *macir,* Gr. *μάκερ,* Skr. *makaranda* = nectar or honey of a flower; *i. e.,* from its odor.

After gathering the fruit its fleshy pericarp is removed, and then this thin coating (arillode) enveloping the seed is peeled off with a knife and dried by sun or fire; or it may be left on seed until they are thoroughly dry, when it freely cracks and peels off. In fresh state it is a brilliant-scarlet, when dry brownish-orange, brittle, in narrow bands, 2.5 Cm. (1′) long, branched, lobed above, united into broader bands below, fatty when scratched or pressed, fracture short, showing many oil-cells; odor fragrant; taste warm, aromatic. *Solvent:* alcohol. Dose, gr. 5–20 (.3–1.3 Gm.).

Commercial.—We have two varieties: 1. *Banda.* 2. *Bombay.*

CONSTITUENTS.—Volatile oil 8 p. c. (mostly macene, $C_{10}H_{16}$, with little oxygenated compound), resin, fat, sugar, dextrin, mucilage, proteids, no starch, ash 1–2 p. c.

PREPARATION.—(Unoff.) *Tinctura Macidis* (1 + 5 parts alcohol).

PROPERTIES.—Stimulant, tonic, chiefly for flavoring, similar to nutmeg.

30. RANUNCULACEÆ. Crowfoot Family.

Ra-nun-cu-la′se-e. L. *Ranuncul-us* + aceæ, dim. of *rana*, a frog; hence little frog, as many species grow in moist places by that reptile. Herbs or shrubs with colorless, acrid, poisonous juice. Distinguished by flowers being regular or irregular, most complete; organs all distinct; no adhesion nor cohesion; often yellow; sepals 3–15, mostly 5 (often petaloid); petals 3–15; only one circle; stamens many, hypogynous; pistils distinct; seed albuminous, superior; temperate climates; narcotic, bitter, tonic, poisonous.

Genera: **1. Hydrastis. 2. Cimicifuga. 3. Delphinium. 4. Aconitum. 5. Pulsatilla (Anemone).**

HYDRASTIS. HYDRASTIS (GOLDEN SEAL).

Hydrastis canadensis, *Linné*. The rhizome and roots.

Habitat. N. America, Canada, east of Mississippi in rich woodlands, mountains.

Syn. Eye Balm or Root. Indian Plant or Dye. Yellow Puccoon or Paint. Jaundice-, Orange-, Turmeric-, Yellow- or Eye Root. Yellow Eye. Puccoon or Indian Paint. Ground Raspberry. Ohio Curcuma. Fr. Racine Orange, Sceau d'Or. Ger. Canadische Gelbwurzel.

Hy-dras′tis. L. fr. Gr. *ὕδωρ*, water, + *δράω*, to act; *i. e.*, alluding to the active properties of the juice, or to the plants growing in marshy places.

Can-a-den′sis. L. of Canada; *i. e.*, its northern habitat limit.

Golden Seal; i. e., its yellow scarred rhizome, once used as a paint and dye.

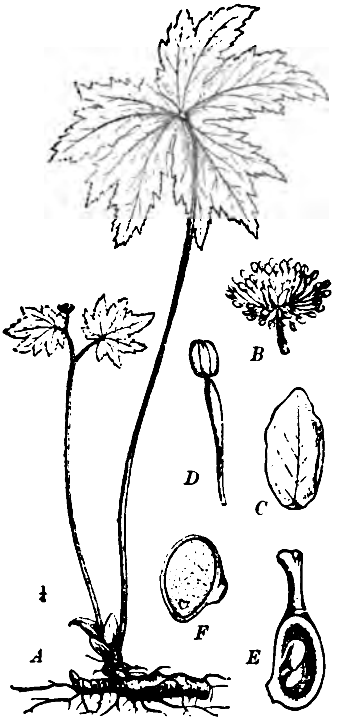
PLANT.—Perennial herb 15–30 Cm. (6–12′) high, simple, hairy, 2-leaved near apex, one sessile at top, the other an inch or so below with thick petiole; leaves pubescent, round, cordate, palmately 5–7-lobed, pointed, serrate, 10–22.5 Cm. (4–9′) wide; flowers May–June, only one, greenish-yellow, arising from upper leaf on a peduncle; fruit compound red berry, 12 Mm. (½′) thick, composed of 12 or more 1–2-seeded berries like raspberry. RHIZOME, 2.5–5 Cm. (1–2′) long, 6 Mm. (¼′) thick, oblique with short branches, annulate, longitudinally wrinkled, brownish-gray; fracture short, waxy, bright-reddish-yellow, bark thick, reddish-yellow, wood-wedges 10, narrow, yellow, medullary rays and pith large; roots thin, subquadrangular, woody centre: odor slight; taste bitter. *Solvents:* diluted alcohol; boiling water. Dose, gr. 5–30 (.3–2 Gm.).

Adulterations.—With serpentaria, cypripedium, xanthorrhiza, etc.

Constituents.—Hydrastine 1.5 p. c., Berberine 3–4 p. c., Canadine, (resin, fluorescent compound, starch, sugar).

Commercial.—The Cherokee Indians imparted the value of hydrastis to the American settlers, it being used by them very early as a domestic remedy and dye; it did not attract medical attention until 1798; soon became a great " Eclectic " drug and afterwards one of our important agents.

Fig. 111.

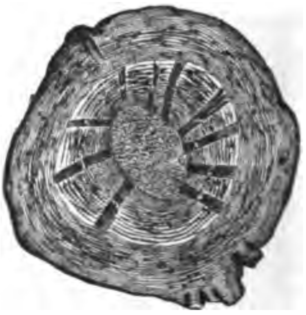


Hydrastis canadensis; *B*, flower; *C*, petal; *D*, stamen; *E*, fruit carpel, longitudinal section; *F*, seed.

Fig. 112.

Hydrastis canadensis; rhizome.

Fig. 113.



Hydrastis rhizome; transverse section, magnified.

Hydrastine, $C_{21}H_{21}NO_6$.—This characteristic colorless alkaloid is obtained by percolating the powdered root with water, adding hydrochloric or sulphuric acid in excess, whereby the corresponding berberine salt deposits in crystals; now concentrate the mother-liquor and add water, to remove fat and resins; to the filtrate add ammonia in excess, when crude hydrastine is precipitated, which may be purified by dissolving in diluted sulphuric acid, again precipitating with ammonia, and repeated crystallizing from hot alcohol; it occurs in white bitter prisms, soluble in alcohol, chloroform and acidulated water; forms several salts, as hydrochlorate, phosphate, sulphate, etc. *Test:* With sulphuric acid and potassium dichromate get red color (dif. from strychnine—violet). When oxidized with manganese dioxide get opianic, and finally hemipinic acid and hydrastinine; on dry distillation have trimethylamine and meconin. Dose, gr. ¼–1 (.016–.06 Gm.).

Hydrastininæ Hydrochloras, Hydrastinine Hydrochlorate, $C_{11}H_{11}NO_2HCl$, *official.*—This hydrochlorate of the artificial alkaloid is obtained by oxidizing hydrastine in acid solution with potassium dichromate or permanganate; it is in dull lemon-yellow crystals or powder, saline deliquescent, soluble in 0.3 part water, 3 parts alcohol, no residue. *Tests:* 1. Aqueous solution (1 + 100,000) has blue fluorescence, not precipitated by ammonia, but by silver nitrate T. S. get a white precipitate, insoluble in nitric acid; 2. 2 Cc. aqueous solution (1 + 100) with excess of bromine water gives yellow precipitate, which dissolves clear in ammonia water (dif. from hydrastine—brick-red precipitate). Used chiefly for uterine hemorrhage (hypodermically). Dose, gr. ⅓–½ (.02–.03 Gm.) in 10 p. c. solution.

Berberine, $C_{20}H_{17}NO_4$.—This colored alkaloid is obtained by the preceding process for separating hydrastine; it occurs in bitter yellow needles, or crystalline powder, soluble in hot water or alcohol; the hot alcoholic solution with iodine gives dark-green lustrous scales; it forms several yellow salts, hydrochlorate, phosphate, carbonate, sulphate, etc., which dissolve in water with difficulty. This alkaloid is also found in berberis, calumba, coptis, menispermum, xanthorrhiza, etc. Dose, gr. ½–1 (.03–.06 Gm.).

Canadine, $C_{21}H_{21}NO_4$.—This forms white needles; in alcoholic solution, with iodine get yellow crystals; it is sometimes called tetrahydroberberine, and differs from hydrastine in being more soluble in acetic ether and alcohol; the hydrochlorate and sulphate only are easily soluble in alcohol or hot water. The name xanthopuccine was once assigned to this alkaloid, but as such it was very likely only impure berberine.

PREPARATIONS.—1. *Extractum Hydrastis Fluidum.* Fluid Extract of Hydrastis. (Syn., Br. Extractum Hydrastis Liquidum; Fr. Extrait liquide de Hydrastis; Ger. Flüssiges Hydrastis Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., alcohol 60, water 30, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

2. *Tinctura Hydrastis.* Tincture of Hydrastis. (Syn., Fr. Teinture de Hydrastis; Ger. Hydrastis-tinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

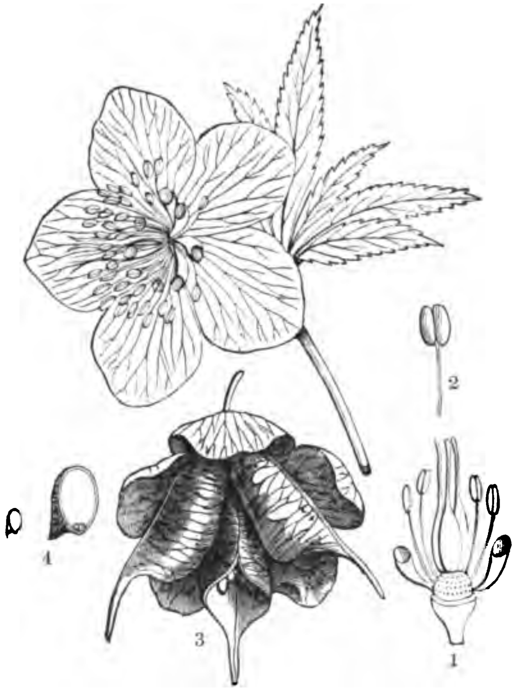
3. *Glyceritum Hydrastis.* Glycerite of Hydrastis. (Syn., Fr. Glycéri d'Hydrastis du Canada; Ger. Gilbwurzel-Glycerit.)

Manufacture: 100 p. c. Macerate, percolate 100 Gm. with alcohol until exhausted, add water 25 Cc. (to remove resin), reclaim alcohol, add water q. s. 50, after 24 hours filter, add glycerin 50. This is used in injections, sprays, etc., instead of colorless proprietary preparations on the market.

Unoff. Preps.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.). Hydrastin of "Eclectics," is a resinoid, prepared by exhausting the drug with alcohol, evaporating, and precipitating with acidulated (HCl) water: it is chiefly berberine muriate, which often occasions for it the substitution of the pure hydrochlorate of that alkaloid. Dose, gr. 2–6 (.13–.4 Gm.).

PROPERTIES.—Upon digestion, circulation, respiration and nervous system analogous to, but much milder than strychnine. Bitter tonic, increases appetite, digestion, gastric secretions (berberine), and the flow of bile; antiperiodic, protoplasmic poison, interfering with the white blood-corpuscle movement, alterative to the mucous membranes, deobstruent to the glandular system, antiseptic, cholagogue, diuretic. Hydrastine acts on the nervous system like quinine, but it is non-toxic, as large doses only produce warmth in the stomach and ringing in the ears.

FIG. 114.



Helleborus viridis. 1, Receptacle, tricarpelled ovary and stamens; 2, a stamen; 3, the three resulting ripened fruits; 4, a seed.

USES.—Chronic dyspepsia and cystitis, catarrhs of the stomach, duodenum, gall-ducts, bladder, uterus and vagina, constipation, bronchitis, malaria, intermittent fever, jaundice. Locally in gonorrhœa, leucorrhœa, otorrhœa, gleet, chronic nasal catarrh and pharyngitis, syphilitic sores in the mouth, nares and throat, unhealthy intractable ulcers and sores, cancers, fistulas, hemorrhoids, fissured nipples, conjunctivitis, tonsillitis, hemorrhage. Hydrastine for chronic malaria is much weaker, but next in value to quinine; hydrastinine (hypodermically) for menorrhagia and metrorrhagia. The yellowish liquids are objectionable owing to their staining properties, for which, however, the Indians valued it in dyeing their yellow fabrics; with indigo it imparts a fine green to wool, silk and cotton.

Poisoning: Same treatment as for nux vomica and strychnine.

Incompatibles: Alkalies, mineral acids, tannic and other vegetable acids, chloral hydrate, potassium bromide, motor depressants.

Synergists: Quinine and the vegetable tonics upon the stomach, ergot upon the uterus, and strychnine upon the spinal cord.

Allied Plants:

1. *Helle'borus ni'ger, Black Hellebore.*—The root (rhizome) official, 1820–1880, C. and S. Europe, mountains. Acaulescent perennial, leaves evergreen, 7–9-lobed, flowers rose-like. Rhizome knotty, 5 Cm. (2′) long, 12 Mm. (½′) thick, blackish, bark thick, wood-wedges 8, medullary rays broad, taste sweet, bitter, usually from Germany, contains helleborin, helleborein, helleboretin, resin, fat. Used for melancholy, mania, dropsy, amenorrhœa, epilepsy, skin troubles; in decoction, infusion, tincture, extract. Dose, gr. 5–20 (.3–1.3 Gm.).

2. *H. fœ'tidus, Bear's foot.*—The leaves official, 1820–1840, Europe. Perennial herb—the most energetic of the genus. Used for asthma, hysteria, hypochondriasis, tænia; in powder decoction, syrup. Dose, gr. 5–20 (.3–1.3 Gm.). *H. vi'ridis, Green Hellebore.* The root (rhizome), United States, Europe. Rhizome about the same as *H. niger*, but has only 4 wood-wedges, and is smaller.

3. *Ado'nis verna'lis, False Hellebore.*—N. Europe, Asia. Plant 25 Cm. (10′) high, leaves light-green, pinnatifid, flowers yellow. Contains chiefly *adonidin* (adonin), an intensely bitter, yellow, hygroscopic glucoside, soluble in water, alcohol. Cardiac stimulant, mild diuretic; resembles digitalis, but is more prompt, non-cumulative; mitral and aortic regurgitation, precordial pain, dyspnœa. Dose of adonidin, gr. $\frac{1}{16}$–$\frac{1}{8}$ (.004–.02 Gm.).

4. *Co'ptis trifo'lia, Gold-thread.*—The root (rhizome) official, 1820–1880, N. America. Plant with scape 7.5–12.5 Cm. (3–5′) high, leaves radical, three-foliate, flowers May, whitish. Rhizome golden-yellow, filiform, fruit seven follicles with black seeds, inodorous, bitter, contains berberine, coptine (white, possibly identical with hydrastine), resin. Used for ulcerated mouth; in infusion, decoction, tincture (10 p. c.). Dose, gr. 15–60 (1–4 Gm.).

5. *Xanthorrhi'za apiifo'lia, Shrub Yellow-root.*—The root official, 1820–1880; S. and C. United States; shrub .6–1 M. (2–3°) high, stem clustered, 6 Mm. (¼′) thick, wood yellow, leaves compound, flowers April, purple, racemes; root .6–1 M. (2–3°) long, 12 Mm. (½′) thick, yellowish internally and externally, bitter, contains berberine, resin, starch. Used as a tonic like calumba or quassia; in infusion, decoction, tincture. Dose, ʒss–1 (2–4 Gm.).

CIMICIFUGA. CIMICIFUGA (BLACK SNAKEROOT).

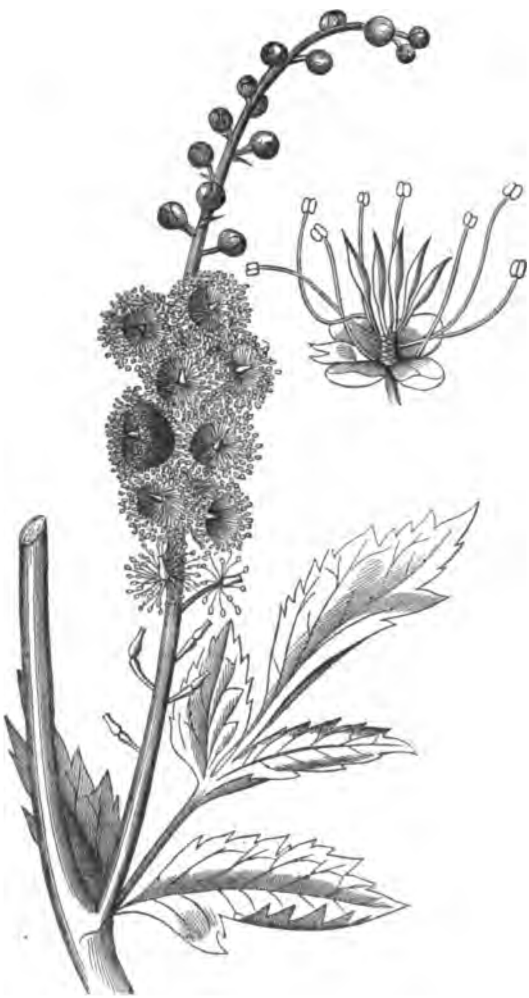
Cimicifuga racemosa, (*Linné*) *Nuttall.* } The rhizome and roots.

Habitat. United States, Canada, in rich woodlands.

Syn. Black Cohosh, Bugbane, Bugwort, Rattle Root, Rattleweed, Rattlesnake's Root, Rich Weed, Squaw Root. Br. Actææ Radix. Fr. Racine d'Actée à Grappes. Ger. Schwarze Schlangenwurzel.

Cim-i-cif′u-ga. L. *cimex*, bug, +*fugare*, to drive away; *i. e.*, from the fact
Cimicifuga fœtida being used for that purpose in Siberia and Kamtchatka.
Ra-ce-mo′sa. L. *racemosus*, full of clusters, racemes; *i. e.*, the flowers.

FIG. 115.



Cimicifuga racemosa.

PLANT.—Perennial; stem slender, unbranched, 1.5–2.5 M. (5–8 high; leaves irregularly ternately decompound, the rather small leaflets incised, 2.5–7.5 Cm. (1–3′ long; flowers June–July, regular, numerous, small, white, in wand-like racemes, 20–50 Cm. (8–20′) long, emit disagreeable odor. RHIZOME, horizontal, 5–15 Cm. (2–6′) long, 2.5 Cm. (1′) thick, hard with many upright branches, terminated by cup-shaped scar, also many bitter, wiry, quadrangular roots, 2 Mm. ($\frac{1}{12}$′) thick, brownish-black, fracture smooth, pith large, surrounded by many sublinear, whitish wood-rays, and a firm but thin bark; the roots show only 4–5 wood-wedges; odor slight, heavy; taste bitter, acrid. This should be collected in autumn, and only used when fresh. *Solvents:* boiling water; alcohol. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS. — Seldom met with; sometimes find caulophyllum, podophyllum each to the extent of 1 p. c., and smaller amount of comfrey, this latter imitating well the blackish color. *Actæ′a spica′ta*, a very common European plant, has closely resembling rhizome, but juicy berries, whereas our official bears dry follicles. *Actæ′a racemo′sa* is but a synonym of *Cimicifuga racemosa*.

CONSTITUENTS.—Cimicifugin, Resins 3½ p. c., fat, starch, gum, tannin, volatile oil, sugar.

Cimicifugin.—Bitter, acrid crystalline principle; obtained by acting on the "Eclectic" resinoid, cimicifugin, or upon the fresh rhizome with alcohol, precipitating (resin, tannin, coloring matter), with lead subacetate, removing lead with hydrogen sulphide and evaporating; it is soluble in alcohol, chloroform, slightly in ether.

Resins.—There are two of these, one soluble in alcohol but not in ether, the other soluble in ether as well as alcohol. These two are obtained as a mixture by exhausting powdered drug with alcohol, precipitating with water, drying precipitate, and thus constitutes the "Eclectic" *cimicifugin* or *macrotin*, a yellowish-brown hydroscopic powder. Dose, gr. ½–2 (.03–.13 Gm.).

PREPARATIONS.—1. *Extractum Cimicifugæ.* Extract of Cimicifuga. (Syn., Fr. Extrait d'Actée à Grappes; Ger. Cimicifuga-Extrakt.)

Manufacture: Macerate, percolate with alcohol q. s. Dose, gr. 1–8 (.06–.5 Gm.).

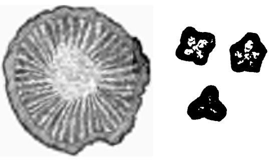
2. *Extractum Cimicifugæ Fluidum.* Fluid Extract of Cimicifuga. (Syn., Br. Extractum Cimicifugæ Liquidum; Fr. Extrait liquide d'Actée à Grappes; Ger. Flüssiges Cimicifuga-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

3. *Tinctura Cimicifugæ.* Tincture of Cimicifuga. (Syn., Br. Tinctura Actææ; Fr. Teinture d'Actée à Grappes; Ger. Cimicifuga-tinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

FIG. 116.



Cimicifuga racemosa; transverse section through a branch of the rhizome and through rootlets; natural size.

Unoff. Preps.: Decoctum, 5 p. c. Dose, ℥ss–1 (15–30 Cc.). *Compd. Syrup,* 4 p. c. (+ glycyrrhiza 2, senega 2, ipecac 1, wild cherry 4). Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Alterative (diuretic, diaphoretic, expectorant), antispasmodic, sedative (arterial and nervous), safer than digitalis, emmenagogue. It acts on the gastric secretion like any other bitter, slightly depresses the rate, but increases the force of the pulse, like digitalis; contracts the uterus, increasing the menstrual flow and arterial tension.

USES.—It was first introduced into medicine, 1831, by Dr. Young. Given as cardiac tonic in fatty heart, chorea, acute and chronic bronchitis, rheumatism, neuralgia, hysteria, phthisis, dyspepsia, amenorrhœa, dysmenorrhœa, seminal emissions. Large doses cause vertigo, tremors, reduced pulse, vomiting, prostration. Once thought good in snake bites, labor pains, and ills of late pregnancy, but not now so considered.

Incompatibles: Iron preparations, stimulants, alcohol, ammonia.

Synergists: Gold, digitalis, ergot, belladonna, etc.

STAPHISAGRIA. STAPHISAGRIA (STAVESACRE).

Delphinium Staphisagria, *Linné.* } The seed.

Habitat. Mediterranean Basin; cultivated, France, Italy.

Syn. Staphisagriæ Semina. Larkspur Herb. Semen Staphidis-agriæ. Semen Pedicularis. Fr. Staphisaigre. Ger. Stephanskörner, Läusekörner.

Del-phin′-i-um. Gr. *δελφίν(ιον)*; L. *delphinus*, a dolphin; *i. e.*, the form of the nectary resembles the imaginary figures of the dolphin.

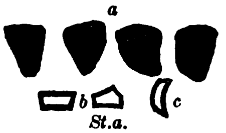
Staph-i-sag′ri-a. L. fr. Gr. *σταφίς*, dried grape, raisin, + *ἀγρία*, wild; *i. e.* fruit clusters resemble wild grapes. *Staves′acre* is only a corruption.

Plant.—Annual herb 1–1.3 M. (3–4°) high, branched, downy; root large, tapering; leaves 10–12.5 Cm. (4–5′) broad; palmately 5–9-parted, with long, hairy petioles, lanceolate, pubescent segments; flowers purplish, racemes; pedicels long, stout, hairy; sepals petaloid; fruit 3, thick, oblong, erect, hairy, veined follicles with prolonged curved beak, each follicle 12-seeded; odor of plant unpleasant. Seed, 5 Mm. (1/5′) long, 3–4 Mm. (1/8–1/6′) broad, flattish-tetrahedral, broadest side convex, testa brownish-gray with reticulate ridges, whitish, oily albumin enclosing a small straight embryo, nearly inodorous, taste bitter, acrid. *Solvents:* alcohol; boiling water. Dose, gr. 1–2 (.06–.13 Gm.).

Constituents.—Alkaloids 1 p. c.: Delphinine, Delphinoidine, Delphisine, Staphisagrine, Staphisagroine, $C_{20}H_{24}NO_4$, malic acid, fixed oil 25 p. c., volatile oil, (proteids, mucilage, ash 9 p. c.).

Delphinine, $C_{22}H_{35}NO_6$.—This leading alkaloid occurs as malate in white acrid crystals; obtained by boiling the decoction with magnesia, treating precipitate with alcohol, evaporating. As such it consists of three distinct principles, one of a resinous nature, separated from its solution in diluted sulphuric acid by adding nitric acid; another which is insoluble in ether (staphisagrine—staphisaine); the third soluble in alcohol, chloroform, ether, and considered pure delphinine. Dose, gr. 1/60–1/10 (.001–.006 Gm.); this also is made into an *ointment*, 5 p. c. and a *liniment*, 5 p. c. with alcohol or olive oil as the base.

Fig. 117.



Stavesacre seed; *a*, Natural size; *b*, cross-section; *c*, longitudinal section.

Delphinoidine, $C_{42}H_{68}N_2O_7$.—Amorphous, alkaline, soluble in alcohol, chloroform, ether; brownish-red with sulphuric acid.

Delphisine, $C_{27}H_{46}N_2O_4$.—Crystalline, soluble in alcohol, chloroform, ether; dark-brown with sulphuric acid.

Staphisagrine, Staphisaine or **Staphisain**, $C_{22}H_{33}NO_5$.—Amorphous, yellow, insoluble in ether, soluble in alcohol, chloroform; bitter, acrid, red and violet with sulphuric acid.

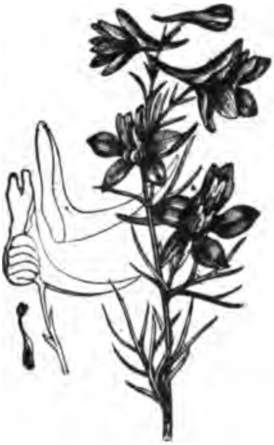
The fixed oil is extracted with ether or benzene, which also takes out delphinine at the same time. It is claimed that delphinine and delphisine have the same composition, $C_{31}H_{49}NO_7$, and that they crystallize alike from their ether or benzene solutions.

Preparations.—(Unoff.) *Fluid Extract* (alcohol). Dose, ♏j–2 (.06–.13 Gm.). *Tincture*, 10 p. c. Dose, ♏v–15 (.3–1 Cc.). *Extract*. Dose, gr. 1/4–1 (.016–.06 Gm.). *Ointment*, 20 p. c. + lard and olive oil, each 40 p. c.

Properties.—Diuretic, cathartic, emetic, rubefacient, poisonous.

Uses.—The seeds were popular with the Greeks, Romans, etc., as emetic, cathartic, but are so dangerous as, in modern times, to be used chiefly externally for killing vermin, lice, itchmite; in rheumatism, neuralgia, earache, toothache, and for catching fish like cocculus indicus; they must never be applied to abrasions. When taken internally cause lessened heart action and respiration, great debility, loss of voluntary movement, then insensibility, frequent spasms, death from spinal-cord paralysis and asphyxia. Delphinine resembles closely aconitine and veratrine, irritating the skin, producing tingling and burning inflammation, even when applied as ointment or liniment.

Fig. 118.



Delphinium Consolida.

Poisoning: Similar to aconite and veratrum; use emetics or pump, draughts of warm water, tannin, powdered charcoal, diffusible stimulants, keep patient quiet, feet elevated, extremities warm. To relieve spasms inhale chloroform or give chloral hydrate (ʒss; 2 Gm.), potassium bromide (ʒj–2; 4–8 Gm.). Use all haste, as death is chiefly by asphyxia.

Allied Plants:

1. *D. Conso′lida, Field Larkspur.*—The seed official, 1820–1880. C. Europe, cultivated and naturalized in the United States. Plant .6–1 M. (2–3°) high, in grain fields, flowers beautiful blue, seed flattish, tetrahedral, 1–2.5 Mm. ($\frac{1}{25}$–$\frac{1}{10}$′) broad, acute edges, testa black, pitted, inodorous, bitter, acrid, used for asthma, dropsy, wounds, ulcerated buboes; in tincture, 5 p. c. (diluted alcohol), fluid extract or decoction; poisonous.

2. *D. Aja′cis*, S. Europe, *D. urceola′tum* (*exalta′tum*), Penn., Minn. *D. carolinia′num* (*azu′reum*), Wis., Ark.—The first has the most dense flowers, the second is the tallest, the third has the lightest blue flowers; all three are cultivated.

ACONITUM. ACONITE (MONKSHOOD, WOLFSBANE).

Aconitum Napellus, *Linné.* { The tuber (tuberous root). Should be collected in autumn or winter after the leaves have fallen, and is not perfect until second year.

Habitat. Europe, Asia, N. America, Himalaya, Alps, Pyrenees Mountains, 3,300–4,800 M. (11,000–16,000°) elevation.

Syn. Friar's cap, Friar's cowl, Wolfroot. Styrian Monkshood, Mousebane. Fr. Aconit, Coqueluchon. Ger. Tubera Aconiti, Akonitknollen, Eisenhut, Sturmhut.

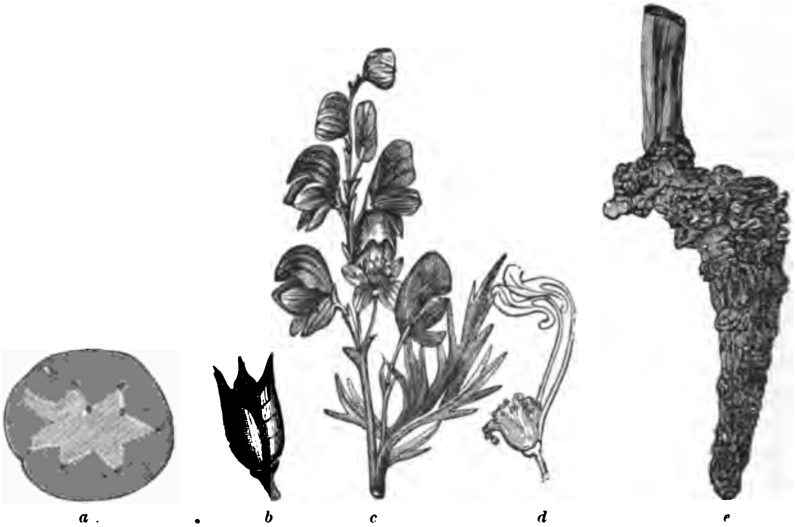
Ac-o-ni′tum. L. fr. Gr. *ἐν*, on, + *ἀκόναις*, rock; *i. e.*, it grows upon steep rocks in the mountains; or fr. Fr. *Acone*, a town in Bithynia, where it grows plentifully.

Na-pel′lus. L. a little turnip; fr. *napus*, a turnip; *i. e.*, mediæval name from shape of roots, once used generically.

PLANT.—Perennial herb; stem .6–1.5 M. (2–5°) high, round, smooth, leafy; leaves 5–10 Cm. (2–4′) broad, palmately 3–7-divided, dark-green above, lighter below, smooth, shining, petiolate, divisions wedge-shaped, with 2–3 lobes extending midway; flowers July, large, beautiful, violet-blue, on stem's summit, racemes, sepals petaloid, nectariferous; fruit, 3–5 pod-like capsules. ROOT, produced at the end of a short rhizome, 12–25 Mm. (½–1′) thick at the crown, conical, 5–7.5 Cm. (2–3′) long, with scars and fragments of rootlets, brown, wrinkled, horny, bark thick, inside whitish, the central axis 7-rayed; inodorous, if fresh, radish-like; taste sweet, acrid, producing a persistent tingling sensation. *Solvent:* alcohol. Dose, gr. 1–2 (.06–.13 Gm.).

ADULTERATIONS.—With allied aconite roots, defective roots, small horse-radish roots (collected only when leaves absent, as by these they can be easily distinguished), yellowish externally, taste exceedingly pungent, irritating; roots of European Masterwort (*Imperato'ria (Peuce'danum) Ostru'thium*) which closely resembles aconite root, but is aromatic, pungent, with oil-cells arranged in several circles, easily visible in cross-sections.

FIG. 119.



Aconitum Napellus; *a*, transverse section of tuber; *b*, fruit carpels; *c*, flowering branch; *d*, flower deprived of calyx, showing the only two peculiarly shaped petals, the other six almost aborted; *e*, tuber.

Commercial.—Plant is cultivated in gardens frequently for its ornamental flowers; was introduced into medicine by Baron Störck, Vienna, 1762, but was known to the ancients as a powerful poison in which all parts of the plant strongly share; by cultivation becomes stronger, and it is this the B. P. requires, collected in autumn. It is mostly supplied and imported from Germany (England, France, Switzerland, India) in packages, bales, etc.

CONSTITUENTS.—Four alkaloids (one crystalline, four amorphous) .07 p. c.: Aconitine .03 p. c.; Aconine, $C_{26}H_{41}NO_{11}$, Napelline (isaconitine, pseudaconitine), $C_{33}H_{45}NO_{12}$, picraconitine, $C_{23}H_{39}NO_{11}$, aconitic acid, $H_3C_6H_3O_6$, resin, fat, sugar.

Aconitine (Benzoyl-aconine), $C_{33}H_{45}NO_{12}$.—Exists in combination with aconitic acid, and is obtained by diluting with water the acidified (tartaric acid) alcoholic tincture, to remove fat and resin, precipitating with sodium bicarbonate, dissolving in ether and crystallizing; it occurs in white flat bitter crystals, soluble in alcohol, chloroform, ether, hot water, and forms many salts, as hydrochlorate, nitrate, sulphate, etc.; heated in sealed tube with water decomposes into aconine and benzoic acid. Commercial aconitine is only six to nine-tenths pure, it being a mixture of the various alkaloids, consequently to that extent is less poisonous than when genuine. *Test:* Dissolve aconitine in diluted phosphoric acid, evaporate until violet color appears. Dose (crystals), gr. $\frac{1}{640}$–$\frac{1}{200}$ (.0001–.00035 Gm.); (amorphous), gr. $\frac{1}{64}$–$\frac{1}{20}$ (.001–.003 Gm.).

PREPARATIONS.—1. *Extractum Aconiti.* Extract of Aconite. (Syn., Fr. Extrait de Racine d'Aconit; Ger. Akonitknollen-Extrakt; Eisenhutknollen-Extrakt.)

Manufacture: Macerate, percolate with alcohol q. s. Dose, gr. $\frac{1}{6}$–$\frac{1}{3}$ (.01–.02 Gm.).

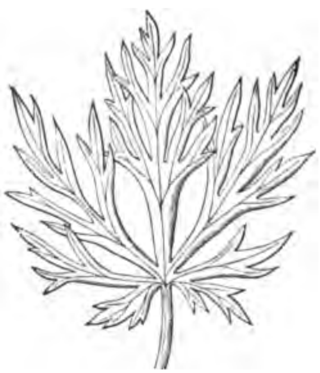
2. *Extractum Aconiti Fluidum.* Fluid Extract of Aconite. (Syn., Fr. Extrait liquide de Racine d'Aconit; Ger. Flüssiges Akonitknollen-Extrakt; Flüssiges Eisenhutknollen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏ss–2 (.03–.13 Cc.).

3. *Tinctura Aconiti.* Tincture of Aconite. (Syn., Fr. Teinture de Racine d'Aconit; Ger. Akonit-tinktur, Eisenhuttinktur.)

Manufacture: 35 p. c. Macerate, percolate 35 Gm. with alcohol 70 p. c., q. s. 100 Cc. This is the best preparation for internal use. Dose, ♏ss–5 (.03–.3 Cc.).

FIG. 120.



Aconitum Napellus leaf, small sized.

Unoff. Preps.: Abstract (alcohol). Dose, gr. $\frac{1}{4}$–1 (.016–.06 Gm.). *Tincture Aconite Leaves,* 8 p. c. (diluted alcohol). Dose, ♏j–6 (.06–.4 Cc.). *Fleming's Tincture Aconite Root,* 70 p. c. (alcohol). Dose, ♏ss–4 (.03–.26 Cc.). *Glycerite, Liniment, Plaster.* Pseudaconitine (*A. ferox*). Dose, gr. $\frac{1}{250}$–$\frac{1}{100}$ (.00026–.00065 Gm.). *Oleate of Aconitine,* 2 p. c., used externally.

PROPERTIES.—Sedative (heart and nerve), anodyne, diaphoretic, antipyretic, myotic, poisonous. Produces tingling and numbness of the lips, mouth and fingers; increases the secretion of the kidneys, salivary glands and skin; circulation (heart action, pulse) becomes weak and slow; respiration (breathing) shallow and slow; temperature is lowered, all causing a tendency to fainting when in the erect position, and giving rise to its popular name "therapeutic lancet"; it paralyzes first the sensory and then the motor nerves. Fatal dose causes an anxious countenance, the pallid, clammy skin to be covered with cold sweat; pulse and respiration to be slow, weak and irregular: muscular weakness, loss of sight, hearing and general anæsthesia, collapse and death from syncope, sometimes preceded by convulsions: conscious until near the end, when carbon dioxide narcosis sets in.

USES.—It should never be given in asthenic or debilitated conditions, or when the heart action is weak, or in stomach catarrh, but employed in all sthenic or inflammatory fevers of the young and vigorous; croup, laryngitis, pharyngitis, tonsillitis, acute meningitis, peritonitis, pleuritis, rheumatism; measles, scarlet fever, erysipelas, first stage of pneumonia, pericarditis and pleurisy, nervous heart palpitation, cardiac hypertrophy. Locally on non-abraded surfaces: neuralgia, rheumatism, sciatica, herpes zoster, chilblains, pruritus, odontalgia, periodontitis, inflamed pulps.

Poisoning: Evacuate stomach, give recumbent position, feet elevated, warmth to extremities, diffusible cardiac stimulants (brandy, whisky, alcohol, ether, ammonia) by the stomach, rectum or skin, then digitalis, tannin; artificial respiration, amyl nitrite, atropine and strychnine (hypodermically) to stimulate heart and respiration.

Incompatibles: Ammonia, alcohol, alkalies, atropine, digitalis, ether, morphine, heat, turpentine.

Synergists: Veratrum viride, pulsatilla, staphisagria, cold, fatigue.

Leaves official, 1820–1880. These are considered 5–20 times weaker than the root, yet many specimens yield considerable alkaloids: their uncertainty and deception have led to disuse, but if collected when flowers are two-thirds in bloom they are reliable; it is then that all nutrient constituents are in demand for the perfection of reproductive organs, thus leaving behind in the leaves a goodly quantity of the (waste products) alkaloids. Dose, gr. 1–4 (.06–.26 Gm.).

Allied Plants:

1. *A. neomonta'num,* leaves official, 1820–1840, and *A. panicula'tum,* leaves official, 1840–1850, possess very little acridity, but even now their roots are collected and mixed with the official.

2. *A. Ca'mmarum* (*variega'tum*).—Europe; root globular, ovate, 12 Mm. (½′) long, pith rays 5, short, rounded, and *A. Störckia'num.* Europe; root conical, slender, pith roundish pentagonal, similar in effect, smaller than, but often found mixed with the official.

3. *A. fe'rox.*—India aconite (native Bikh or Bish) is the strongest species, with root 5–10 Cm. (2–4′) long, 2.5 Cm. (1′) thick, conical and brown; *A. uncina'tum* and *A. lu'ridum* roots are collected with this, as they all have constituents similar to the official, but here pseudaconitine predominates.

4. *A. Fi'scheri* and *A. japo'nicum, Japanese and Chinese Aconite.*—Roots napiform, long, pith circular, 5–7-rayed; allied to former is *A. columbia'num;* Rocky Mountains; poisonous.

5. *A. heterophy'llum.*—India; fusiform, conical, bitter, not acrid or

poisonous; *A. Antho'ra.* Europe; fusiform, long, pith thin, rays short and long, and *A. Lyco'ctonum,* Europe, N. Asia; rhizome oblique, several-headed, bitter.

PULSATILLA. PULSATILLA.

Pulsatilla Pulsatilla, (*Linné*) *Lyons.* ⎫
(**Anemone Pulsatilla,** *Linné.*) ⎬ The herb, collected soon after flowering.
Pulsatilla pratensis, (*Linné*) *Miller.* ⎪
(**Anemone pratensis,** *Linné.*) ⎭

Habitat. Europe, England, Siberia. Sandy soil, open woods.

Syn. Pasque Flower. Anemone, Meadow Anemone. Wind Flower. Fr. Coquelourde. Ger. Küchenschelle.

Pul-sa-til'la. L. *pulsare,* p. p. *pulsatus,* beat, strike; *i. e.,* it pulsates from, or the flowers open by the blowing winds.

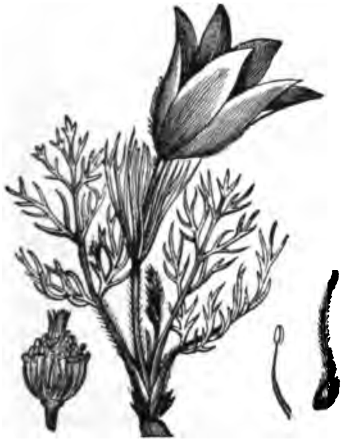
Pra-ten'sis. L. belonging to the meadow, *pratum,* a meadow; *i. e.,* its preferred place of growth.

A-nem'o-ne. L. fr. Gr. ἄνεμος, the wind—wind-flower; *i. e.,* many of the species inhabit elevated, windy places.

Pasque Flower. Gr. πάσχα, passover, the Jewish feast, our Easter; *i. e.,* the European species blooms at this time, allowing its flowers to be used in the religious celebration.

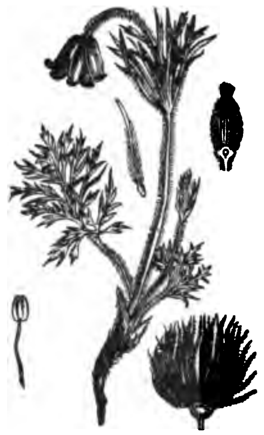
Plants.—Perennial herbs 10–25 Cm. (4–10′) high; stems simple, erect, naked except floral leaf or scape, which bears a large terminal flower; flowers March–May, bell-shaped, violet, purple, 6 sepals, 2.5–4 Cm. (1–1½′) wide; fruit achenes, numerous, short-beaked; blunt or with slender, silky tails 5 Cm. (2′) long; root dark-brown, oblique, several-headed; leaves radical, petiolate, silky, villous, twice or thrice deeply three-parted or pinnately-cleft, with linear acute lobes, appearing after the large purple flowers; involucre sessile, lobed like leaves. All herbaceous parts covered with soft, silky hairs; inodorous, very acrid, should be well preserved and not kept longer than one year, owing to volatility of anemonin, its chief constituent. *Solvents:* alcohol; boiling water partially. Dose, gr. 1–5 (.06–.3 Gm.).

Fig. 121.



Pulsatilla (Anemone) Pulsatilla.

Fig. 122.



Pulsatilla (Anemone) pratensis.

CONSTITUENTS.—Anemonin, $C_{10}H_8O_4$, Acrid Anemone Camphor, anemonic acid, $C_{10}H_{10}O_5$, anemoninic acid, $C_{10}H_{12}O_6$.

Anemonin (*anemoninum*).—Obtained by distilling the fresh herb with water, when it deposits in crystals from the distillate upon standing; it resembles camphor, being colorless, odorless, and acrid when melted or distilled with water; soluble in chloroform, hot alcohol, and by alkalies converted into anemoninic acid. Dose, gr. ¼–¾ (.016–.05 Gm.), in pill.

Acrid Anemone Camphor.—Oily, crystallizing, not fusible or volatile, but distils from the herb with water; soluble in chloroform; neutral; spontaneously decomposed into anemonin and insoluble isoanemonic acid, $C_{10}H_{10}O_5$.

PREPARATIONS.—(Unoff.) *Extract* (expressed juice of fresh herb, heated, strained from albumin, evaporated to small bulk, mixed with equal quantity of alcohol, evaporated). Dose, gr. ½–3 (.03–.2 Gm.). *Tincture* (prepared as Tincturæ Herbarum Recentium, U. S. P.; bruise, macerate fresh herb 50 Gm. in alcohol 100 Cc., for two weeks, express, filter). Dose, ♏$\frac{1}{10}$–10 (.006–.6 Cc.). *Homœopathic Tincture* (imported—expressed juice + alcohol equal parts). *Infusion*, 5 p. c. Dose, ℥ss–1 (15–30 Cc.).

PROPERTIES.—Sedative, anodyne, antispasmodic, emmenagogue, vesicant, emetic, diuretic, diaphoretic, expectorant, mydriatic, has special influence upon mucous membranes, poisonous. On the tongue like aconite (tingling, numbness), lowers heart and arterial tension, reduces respiration and temperature, may cause nausea, vomiting, gastric irritation, motor and sensation paralysis, stupor, coma, convulsions, death. Externally the fresh juice causes numbness, tingling, skin inflammation, and eruptions.

USES.—Amenorrhœa, dysmenorrhœa, paralysis, rheumatism, gout, nervous headache, epididymitis, orchitis, leucorrhœa, dyspepsia, gastritis, flatulence, coryza, otitis, rhinitis, bronchitis, asthma, convulsive coughs, whooping-cough, corneal opacity, cataract, conjunctivitis, eczema, old ulcers, syphilitic sores, scaly skin diseases, meningitis, remittents, measles.

Poisoning: Similar to aconite; give emetic, tannin, place in recumbent position, feet elevated, follow with digitalis, opium, stimulants, alcohol, brandy, ammonia, etc.

Incompatibles: Caustic alkalies, tannin, metallic salts.

Synergists: Same as for aconite.

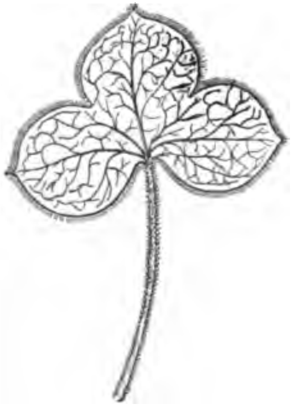
Allied Plants:

1. *P. hirsuti'ssima* (*Anemone pa'tens* var. *Nuttalli'ana*).—Herb official, 1880–1890, W. N. America; flowers whitish, purplish, sepals 5–7, 2.5–4 Cm. (1–1½′) long, developed before the leaves. *A. quinquefo'lia* (*nemoro'sa*), *Wood Flower*, *Wood Anemone*, N. America; flowers purplish-white. *A. corona'ria*, *A. sylve'stris*, and *A. ranunculoi'des*, Levant, Asia, Europe; all are acrid and deteriorate upon drying.

2. *Hepa'tica Hepatica* (*trilo'ba*), *Noble Liverwort.*—The leaves official, 1830–1880, N. America, Europe. One of our earliest harbingers

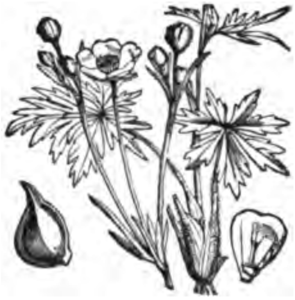
of spring; acaulescent perennial, flowers April, bluish, leaves reniform, 5 Cm. (2′) long, 3-lobed, contains mucilage, tannin, used as tonic, demulcent, deobstruent, for liver troubles, bronchitis; phthisis; in decoction, infusion. Dose, ʒss–2 (2–8 Gm.).

FIG. 123.



Hepatica Hepatica (triloba). Leaf showing venation.

FIG. 124.



Ranunculus in bloom.

3. *Ranu′nculus bulbo′sus, Bulbous Buttercup.*—The corm and herb official, 1820–1880, Europe, N. America, plant hairy, 15–45 Cm. (6–18′) high, bulb at stem base, flowers May, yellow, 5's; contains volatile oil (anemonin + anemonic acid). Used as irritant, diuretic, narcotic, externally in bronchitis, rheumatism, sciatica; in decoction, infusion. Dose, ʒss–1 (2–4 Gm.).

31. BERBERIDACEÆ. Barberry Family.

Ber-be-ri-da′se-e. L. *Berber(is)id* + aceæ, fr. *Berberys*—Arabic name of the fruit. Shrubs, herbs with watery juice. Distinguished by few stamens (same number as petals and opposite them) in 2–3 whorls, anthers opening by 2-hinged valves (Podophyllum, longitudinal, as in Ranunculaceæ); leaves usually with spiny teeth, sometimes reduced to spines or barbs, hence the name *barberry;* sepals and petals in 2 rows, 3 each, imbricate; ovary 1-celled, superior; temperate climates, tropics; cathartic, astringent, bitter, acrid (oxalic), yellow dye.

Genera: 1. **Caulophyllum.** 2. **Podophyllum.**

CAULOPHYLLUM. CAULOPHYLLUM (BLUE COHOSH).

Caulophyllum thalictroides, (*Linné*) *Michaux.* } The rhizome and roots, collected in spring or early summer.

Habitat. N. America (Can., S. Ca., Ky.), in rich woodlands.

Syn. Blueberry. Blue or Yellow Ginseng. Pappoose or Squaw root.

Cau-lo-phyl′lum. L. *caulis* +*folium*, fr. Gr. *καυλός*, a stem, stalk, + *φύλλον*, a leaf; *i. e.*, the stem so continues as to resemble a long petiole of the compound leaf.

Tha-lic-troi′des. L. fr. Gr. *θάλλω*, to be luxuriant, to grow green, + *εἶδος*, resembling; *i. e.*, from the abundant early bright-green foliage and young shoots.

PLANT.—Perennial herb; stem .6 M. (2°) high, smooth, with large triternately compound leaf at summit; leaflets obovate, wedge-form, 3–5-lobed; flowers April–May, greenish-yellow. RHIZOME, horizontal, 10 Cm. (4′) long, 8 Mm. ($\frac{1}{3}'$) thick, knotty on upper surface from the concave stem-scars and short branches, grayish-brown, internally whitish, tough, woody; roots many, matted, 12.5 Cm. (5′) long, 1 Mm. ($\frac{1}{25}'$) thick, tough, wiry, nearly inodorous; taste sweet, bitter, acrid. *Solvents:* alcohol; boiling water. Dose, gr. 10–30 (.6—2 Gm.).

CONSTITUENTS.—Caulophylline, Caulophyllin (resins) 12 p. c., Saponin, tannin, wax.

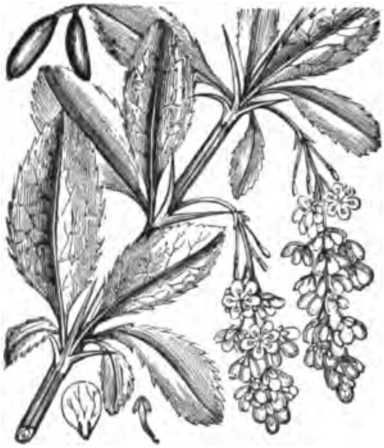
Caulophylline.—An alkaloid, obtained by exhausting with 60 p. c. alcohol; reclaim alcohol, add water, filter, evaporate to syrup, extract with chloroform in the presence of ferric hydroxide and sodium bicarbonate. It is colorless, odorless, nearly tasteless, soluble in water, alcohol, ether, chloroform, not precipitated by alkalies, crystallizes with difficulty; forms the hydrochlorate.

Caulophyllin. — The "Eclectic" resinoid, obtained by exhausting with alcohol, concentrating and throwing into water; brown powder. Dose, gr. ½–4 (.03–.26 Gm.).

Saponin (Leontin).—A glucoside, white, feathery, sternutatory, acrid, soluble in hot alcohol, ether.

PREPARATIONS.—(Unoff.) *Tincture,* 25 p. c. Dose, ʒj–2 (4–8 Cc.). *Decoction, Infusion* (both 5 p. c.). Dose, ℥j–2 (30–60 Cc.). *Fluid Extract.* Dose, ♏x–30 (.6–2 Cc.). *Extract.* Dose, gr. 2–5 (.13–.3 Gm.).

FIG. 125.



Berberis vulgaris (canadensis).

PROPERTIES.—Antispasmodic, diuretic, emmenagogue, demulcent, sternutatory, sedative, oxytocic.

USES.—Hysteria, amenorrhœa, spasmodic dysmenorrhœa, menorrhagia, uterine subinvolution (causing muscular contraction), arrests or produces abortion. The aborigines thought this their best parturient, as drinking the infusion several weeks before labor rendered delivery rapid and almost painless according to their fancied belief.

Allied Plant:

1. *Be′rberis vulga′ris* (*canade′nsis*).—The fruit official, 1830–1840; the bark of root, 1860–1880. Spreading shrub, 1–2 M. (3–6°) high, thorny branches, bark gray, wood yellow, leaves toothed, spiny; flowers June, yellow, racemes; berries oval, scarlet; root bark yellowish-gray, separable into laminæ, bitter, astringent. Contains berberine, fat, resin, tannin, oxyacanthine, berbamine; fruit has malic and citric acids, tannin, used in febrile diseases, diarrhœa; bark for

dysentery, dropsy, dyspepsia, to reduce spleen, much like calumba. **Dose** of bark, gr. 2–10 (.13–.6 Gm.); in infusion, decoction. Fruit **juice** sometimes made into syrup, preserves, etc.

PODOPHYLLUM. PODOPHYLLUM (May Apple).

Podophyllum peltatum, *Linné.* } The rhizome and roots.

Habitat. N. America (Canada, United States), in rich woods, thickets.

Syn. American or Wild Mandrake. Raccoon or Yellowberry. Ground or Wild Lemon. Hog or Indian Apple. Duck's Foot. Vegetable Mercury. Fr. Rhizome de Podophyllum. Ger. Fussblattwurzel.

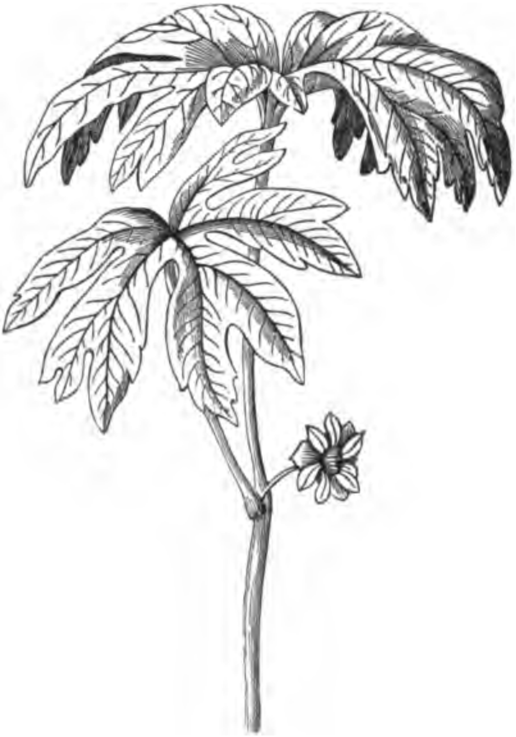
Pod-o-phyl′lum. L. fr. Gr. ποδός, foot, + φύλλον, leaf; *i. e.*, its 5-7-parted leaf resembles the foot of aquatic birds or domestic fowls, as ducks, etc.

Pel-ta′tum. L. *peltatus*, having a pelta or light shield; *i. e.*, petioles attached to the middle of the lamina instead of to the margin.

May apple; i. e., plant blooms in May, thus starting the fruit, which ripens in summer (August).

Plant.—Perennial herb; stem .3 M. (1°) high, pale-green, divides near the summit into 2 petioles, each bearing a palmately 5–7-deeply-lobed, peltate leaf 10–15 Cm. (4–6′) wide, segments wedge-shaped, coarsely toothed at their ends, glaucous-green, petioles 7.5 Cm. (3′) long; flowers May, borne at fork of petioles, single, nodding, white, 5 Cm. (2′) broad, 6–9 petals, 12–18 stamens; fruit yellowish berry, 2.5–5 Cm. (1–2′) long, ovoid, fleshy, soft, indehiscent; seeds about 12; often eaten by animals, hence some of its names. Rhizome, horizontal, creeping, 1.3–2 M. (4–6°) long (in shops as fragments, 2.5–20 Cm. (1–8′) long), 5 Mm. ($\frac{1}{5}$′) thick, consisting of joints or annual sections 2.5–7.5 Cm. (1–3′) long, the ends of which enlarged to 12 Mm. ($\frac{1}{2}$′), and marked with distinct circular stem-scars on upper side, also a tuft of 10–12 simple fragile roots on lower side, sometimes branched laterally, smooth or wrinkled, orange-brown; internally white,

Fig. 126.



Podophyllum peltatum.

mealy, with a circle of small wood-bundles, pith large, nearly inodorous; taste sweet, bitter, acrid, powder yellowish-gray. Should collect rhizome in Aug.–Sept., soon after the leaves fall off. *Solvents:* alcohol; boiling water partially. Dose, gr. 5–15 (.3–1 Gm.).

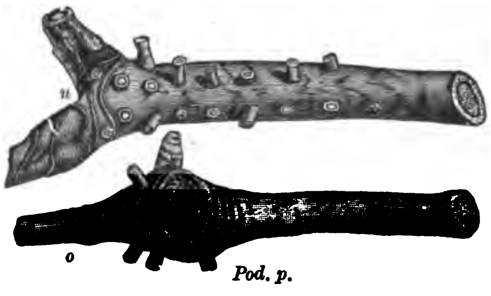
ADULTERATIONS.—Owing to similarity of leaves collectors often include sanguinaria, which, in spite of usual greater value, occurs to the extent of 2–3 p. c.; in the same quantity geranium is frequently found, with less amount of comfrey.

Commercial.—Podophyllum roots and rhizomes containing much resin are surprisingly heavy considering their appearance, and break with an elastic, but short fracture, giving more or less noise; the trade recognizes the drug often by the names: *thick, thin, heavy, light,* which chiefly has reference to physical characteristics. The fall collection is always preferred, as it is heavier, from abundance of resin, and breaks with a cleaner fracture.

CONSTITUENTS.—Resin 4–5 p. c., starch, sugar, green oil, fatty acid.

Resin. (**Resina Podophylli. Podophyllin.**)—This is a complex substance consisting of: (1) *podophyllotoxin,* $C_{15}H_{14}O_6$, 40–60 p. c., which is obtained after removing the fat with benzin, by precipitating the podophyllinic acid from a chloroformic solution of the resin or rhizome, by the addition of ether and then simply evaporating the ethereal solution; this is the cathartic principle, being whitish, bitter, resinous, crystallizable, soluble in chloroform, ether, acetone, alcohol; cherry-red, then greenish-blue and violet by sulphuric acid, when heated with alkalies is converted by hydration into podophyllic acid, $C_{15}H_{16}O_7$, which readily loses water, forming crystalline picropodophyllin (inactive, isomeric with podophyllotoxin); (2) *podophyllinic acid,* which is an inactive resin-acid, insoluble in ether, but soluble in chloroform or alcohol, and obtained by the above process for podophyllotoxin (being precipitated and left behind upon the addition of ether). The color is due to *podophyllo-quercetin,* which occurs in yellow needles, insoluble in water, slightly in chloroform, more so in ether, freely in alcohol. The small amount of uncrystallizable resin, *podophyllo-resin,* is also purgative.

FIG. 127.



Podophyllum; *u*, under side; *o*, upper side.

PREPARATIONS.—1. *Extractum Podophylli.* Extract of Podophyllum. (Syn., Extract of May Apple or Mandrake; Fr. Extrait de Podophylle; Ger. Fussblattwurzel-Extrakt.)

Manufacture: Macerate, percolate with alcohol 80 p. c., q. s., Dose, gr. 5–10 (.3–.6 Gm.).

2. *Extractum Podophylli Fluidum.* Fluid Extract of Podophyllum. (Syn., Fluid Extract of May Apple or Mandrake; Fr. Extrait liquide de Podophylle; Ger. Flüssiges Fussblattwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 80 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

3. *Resina Podophylli.* Resin of Podophyllum. (Syn., Fr. Résine de Podophylle; Ger. Podophyllinum, Podophyllumharz.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 160 Cc., recover same, and precipitate by throwing residue into 100 Cc. acidulated (HCl, 1 Cc.) water. Dose, gr. $\frac{1}{8}$–1 (.008–.06 Gm.).

Unoff. Preps.: Tincture, 2 p. c. of resin in alcohol. Dose, ♏x–30 (.6–2 Cc.). *Abstract* (alcohol). Dose, gr. $\frac{1}{4}$–2 (.016–.13 Gm.). Pure Podophyllotoxin. Dose, gr. $\frac{1}{12}$–$\frac{1}{8}$ (.005–.008 Gm.).

PROPERTIES.—Hydragogue cathartic, cholagogue, alterative, irritant, tonic. Increases intestinal secretion, bile-flow, causes copious watery stools, griping, nausea in from 6–10 hours, acts mainly on the duodenum, but is a powerful intestinal irritant, resembling jalap and calomel, only slower; large doses are distinctly poisonous, producing in the young vomiting, purging, collapse, coma, finally epileptiform convulsions. Those employed in powdering the drug have irritation of the eyes, nose, mouth, respiratory passages, and skin. The resin applied to ulcers produces purgation and is also a powerful irritant to the skin. Its action upon the liver, being somewhat similar to that of mercury, early led some to claim for it equal alterative properties to that metal, and for a time it was employed under the name of "vegetable calomel" in those diseases for which mercury is a recognized specific; it is now, however, believed to have incidentally only very slight alterative power, and to possess no property in common with mercury, save that of catharsis.

USES.—Constipation, torpid liver, lead costiveness, diarrhœa, catarrhal or malarial jaundice, remittent fevers, dyspepsia, bilious vomiting, and headache. With cream of tartar good in dropsies, rheumatic, scrofulous, and syphilitic affections; should be associated with hyoscyamus or belladonna to overcome griping, and, owing to extreme slow action, should not be given in combination with brisk cathartics, but preferably with such as act in approximately the same time, as calomel, jalap, aloes, leptandra, etc.; gr. 5 (.3 Gm.) of podophyllin (resin) have killed, so have ʒiss (6 Gm.), but gr. 10 (.6 Gm.) failed in one case to produce more than abdominal pains.

Allied Plant:

1. *P. Emo'di.*—Himalaya Mountains. Rhizome cylindrical; stem-scars crowded above, many roots below; yields resin 10–12 p. c., which contains 56 p. c. podophyllotoxin. Dose of resin, gr. $\frac{1}{8}$–1 (.008–.06 Gm.). This is very similar to, but stronger than our official drug.

RECAPITULATION No. 3.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Ulmaceæ:								
1. Ulmus. 2. Elm (Slippery Elm).	Ulmus fulva.	The inner bark.	N. America.	Mucilage, starch, tannin, bitter principle.	Mucilage.	Demulcent, emollient, nutritious.	Diarrhœa, urinary troubles, bronchitis, boils, fissures, strictures.	120–240 (8–15 Gm.)
Moraceæ:								
1. Ficus. 2. Fig.	Ficus Carica.	The fleshy receptacle.	W. Asia.	Grape sugar, gum, fat, salts.	Confection of senna.	Nutritious, demulcent, laxative.	Habitual constipation, gum-boils, abscesses.	Ad libitum.
1. Humulus. 2. Hops.	Humulus Lupulus.	The strobiles.	N. Temperate Zone.	Vol. oil, resin, asparagin, choline, tannin.	Tincture.	Tonic, sedative, anodyne, hypnotic.	Dyspepsia, delirium, priapism, bladder troubles, rheumatism, abscesses, colic, bruises, spasms.	30–60 (2–4 Gm.)
1. Lupulinum. 2. Lupulin.		The glandular powder of the strobiles.		Vol. oil, choline, resin, lupamaric acid.	Fluid extract, oleoresin.			5–15 (.3–1 Gm.)
1. Cannabis Indica. 2. Indian Cannabis (Indian Hemp).	Cannabis sativa.	The female flowering tops.	Asia, N. India.	Cannabin, cannabine, cannabinon, vol. oil, cannabinine, gum, KNO_3.	Extract, fld. extr., tincture.	Anodyne, nervine, sudorific, narcotic, aphrodisiac.	Neuralgia, gout, tetanus, chorea, hysteria, epilepsy, delirium tremens.	2–5 (.13–.3 Gm.)
Santalaceæ:								
1. Oleum Santali. 2. Oil of Santal (Sandalwood).	Santalum album.	The volatile oil.	S. India, E. Indian Islands.	Santalal = $C_{15}H_{24}O$. Santalol = $C_{15}H_{26}O$.	....	Astringent, stimulant, diuretic.	Bronchitis, gonorrhœa, cystitis, pyelitis, diarrhœa.	Minims. 5–20 (.3–1.5 Cc.)
Aristolochiaceæ:								
1. Serpentaria. 2. Serpentaria (Virginia Snakeroot).	Aristolochia: Serpentaria, reticulata.	The rhizome and roots.	United States.	Volatile oil, aristolochine, resin, tannin, starch.	Fld. extr., tinct., tr. cinch. co.	Stimulant, tonic, diaphoretic, antiperiodic.	Pneumonia, intermittents, dyspepsia, diphtheria.	Grains. 5–30 (.3–2 Gm.)
Polygonaceæ:								
1. Rheum. 2. Rhubarb.	Rheum officinale.	The root.	W. and C. China.	Chrysophan, chrysophanic acid, resins (phæoretin, erythroretin, aporetin), emodin, rheïn, starch, rheotannic acid, Ca oxalate.	Extr., fld. extr., mixt. rhei et soda, syrup, pills, pills comp., pulv. comp., tinct., ar. tr., ar. syr., sweet tinct.	Aperient, purgative, astringent, tonic.	Diarrhœa, hemorrhoids, chronic dysentery, thread-worms, bilious fever.	5–30 (.3–2 Gm.)
1. Rumex. 2. Rumex (Yellow Dock).	Rumex crispus.	The root.	Europe.	Chrysophanic acid, tannin, Ca oxalate, starch, mucilage.	Fluid extract.	Astringent, alterative, laxative, antiscorbutic.	Skin troubles, itch, scrofula, syphilis, liver congestion, dyspepsia.	15–60 (1–4 Gm.)
Chenopodiaceæ:								
1. Chenopodium. 2. Chenopodium (American Wormseed).	Chenopodium: ambrosioides, anthelminticum.	The fruit.	W. Indies, C. and S. America.	Volatile oil.	Oil.	Anthelmintic, vermifuge, roundworms.	Worms, intermittents, hysteria, chorea, nervousness, tænia.	15–30 (1–2 Gm.)

Phytolaccaceæ: 1. Phytolaccæ fructus. 2. Phytolacca fruit (Bacca, Poke Berry).	Phytolacca decandra.	The fruit.	N. America.	Phytolaccic acid, sugar, gum, coloring.	....	Alterative, laxative, emetic, anodyne, resolvent.	Rheumatism, skin diseases, syphilis, diphtheria, scrofula, hemorrhoids, itch, mange, ringworm.	5-15 (.3-1 Gm.)
1. Phytolaccæ radix. 2. Phytolacca root (Poke Root).	....	The root.	....	Resin, glucoside, tannin, starch, mucilage, vol. acid.	Fluid extract.			5-30 ' (.3-2 Gm.)
Magnoliaceæ: 1. Illicium. 2. Illicium (Star Anise).	Illicium verum.	The fruit.	N. Anam.	Volatile oil, fat, saponin.	....	Carminative, stimulant, anodyne, diuretic.	Colic, indigestion, bronchitis, flavoring.	5-30 (.3-2 Gm.)
Myristicaceæ: 1. Myristica. 2. Nutmeg. 1. Macis. 2. Mace.	Myristica fragrans.	The seed. The arillode of the seed.	Moluccas (Spice Islands), India.	Volatile oil, fixed oil, starch, proteids. Volatile oil, resin, fat, gum.	Tr. lav. co., tr. rhei ar., ar. pulv., troch. sod. bicarb., acet. opii., *Oil:* spirit.	Stimulant, stomachic, condiment, flavoring, narcotic.	Flatulence, diarrhœa, nausea, colic, dyspepsia, carminative.	5-20 (.3-1.3 Gm.) 5-20 (.3-1.3 Gm.)
Ranunculaceæ: 1. Hydrastis. 2. Hydrastis (Golden Seal).	Hydrastis canadensis.	The rhizome and roots.	N. America.	Hydrastine, berberine, canadine.	Glycerite, fld. extr., tincture, hydrastinine hydrochlorate.	Alterative, tonic, aperient.	Dyspepsia, costiveness, malaria, jaundice, catarrh, gonorrhœa.	5-30 (.3-2 Gm.)
1. Cimicifuga. 2. Cimicifuga (Black Snakeroot).	Cimicifuga racemosa.	The rhizome and roots.	N. America.	Cimicifugin, resins, fat, tannin.	Extract, fld. extr., tincture.	Alterative, emmenagogue, sedative.	Bronchitis, rheumatism, amenorrhœa, chorea, dyspepsia.	5-30 (.3-2 Gm.)
1. Staphisagria. 2. Staphisagria (Stavesacre).	Delphinium Staphisagria.	The seed.	Mediterranean Basin.	Delphinine, delphinoidine, dephisine, staphisagrine, fixed oil.	....	Diuretic, cathartic, rubefacient, poisonous.	Parasiticide, rheumatism, neuralgia, itch, vermin.	1-2 (.06-.13 Gm.)
1. Aconitum. 2. Aconite (Monkshood, Wolfsbane).	Aconitum Napellus.	The tuber (tuberous root).	Europe, Asia, N. America.	Aconitine, aconine, napelline, picraconitine, pseudaconitine, resin, aconitic acid.	Extract, fld. extr., tincture.	Sedative, anodyne, poison.	Fevers, rheumatism, neuralgia, gout, pneumonia.	1-2 (.06-.13 Gm.)
1. Pulsatilla. 2. Pulsatilla.	Pulsatilla: Pulsatilla, pratensis.	The herb.	Europe.	Anemonin, anemone camphor, anemonic acid, anemoninic acid.	....	Diuretic, diaphoretic, expectorant, irritant.	Asthma, coughs, bronchitis, dysmenorrhœa, orchitis, etc.	1-5 (.06-.3 Gm.)
Berberidaceæ: 1. Caulophyllum. 2. Caulophyllum (Blue Cohosh).	Caulophyllum thalictroides.	The rhizome and roots.	N. America.	Caulophylline, caulophyllin (resins), saponin, tannin.	....	Antispasmodic, diuretic, emmenagogue.	Hysteria, amenorrhœa, dysmenorrhœa, miscarriage.	10-30 (.6-2 Gm.)
1. Podophyllum. 2. Podophyllum (May Apple).	Podophyllum peltatum.	The rhizome and roots.	N. America.	Resin-podophyllin, starch, fat.	Extract, fluid extract, resin.	Cathartic, tonic, alterative.	Constipation, torpid liver, diarrhœa, fevers, jaundice.	5-15 (.3-1 Gm.)

32. MENISPERMACEÆ. Moonseed Family.

Men-i-sper-ma′se-e. L. *Menisperm-um* + aceæ, fr. Gr. μήνη, the moon, + σπέρμα, a seed; *i. e.*, fruit (seed) kidney or crescent-shaped. Shrubs, woody climbers or herbaceous vines; leaves exstipulate, alternate; flowers diœcious; sepals 4–12; petals 6, similar, usually in two rows, imbricate; stamens mostly 6; fruit drupe, superior; species very heteromorphous; embryo horseshoe-shaped; albumin scanty; tropics; bitter, narcotic, tonic, poisonous.

Genera: 1. **Menispermum.** 2. **Chondrodendron.** 3. **Jateorrhiza.** 4. **Anamirta.**

MENISPERMUM. MENISPERMUM (YELLOW PARILLA, CANADIAN MOONSEED).

Menispermum canadense, *Linné.* } The rhizome and roots.

Habitat. N. America (Canada to S. Carolina, west to Mississippi), banks of streams.

Syn. Moonseed Root. Sarsaparilla. Texas or Yellow Sarsaparilla. Vine Maple. Fr. Ménisperme du Canada. Ger. Canadisches Mondkorn.

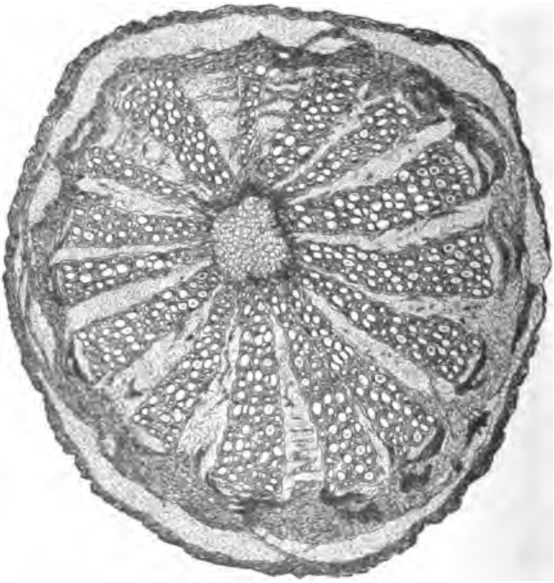
Men-i-sper′mum. L. see etymology, above, of Menispermaceæ.

Can-a-den′se. L. of or belonging to Canada. Canadian.

Pa-ril′la. Contr. *sarsaparilla* = Sp. *zarza*, a bramble, + *parilla*, dim. of *parra*, a trained vine, or after Dr. Parillo, who first used it.

PLANT.—Perennial climber, 2.5–3.5 M. (8–12°) long; stem round, striate; leaves 10–12.5 Cm. (4–5′) broad, peltate, 3–7-lobed, petioles 7.5–12.5 Cm. (3–5′) long, pale beneath; flowers June–July, small, in

FIG. 128.



Menispermum canadense; transverse section of rhizome magnified.

axillary clusters, yellow ; fruit Sept., 8 Mm. (⅓′) thick, black, resembling grapes. RHIZOME, 1 M. (3°) long, 6 Mm. (¼′) thick, yellowish-brown, knotty, wrinkled lengthwise, with many brittle roots, fracture tough, woody, inside yellowish, bark thick, wood-rays broad, porous, and longest on lower side, pith distinct ; nearly inodorous ; taste bitter. *Solvent :* alcohol (70 p. c.). Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Berberine (yellow), Menispine, starch, gum, resin, tannin.

Menispine.—Alkaloid, white, soluble in alcohol, ether, insoluble in benzene and alkaline solutions ; gives with sulphuric acid brown, and with fused zinc chloride brownish-yellow color.

PREPARATIONS.—1. *Extractum Menispermi Fluidum.* Fluid Extract of Menispermum. (Syn., Fluid Extract of Yellow Parilla or Canadian Moonseed ; Fr. Extrait liquide de Menisperme du Canada ; Ger. Flüssiges Canadisches Mondkorn-Extrakt.)

Manufacture : Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

PROPERTIES.—Tonic, alterative, diuretic.

USES.—Similar to calumba (owing to its bitterness), scrofulous affections, as a substitute for sarsaparilla.

PAREIRA. PAREIRA (PAREIRA BRAVA).

Chondrodendron tomentosum, *Ruiz et Pavon.* } The root.

Habitat. Brazil (near Rio Janeiro, and in other parts), Peru.

Syn. Br. Pareiræ Radix. Velvet leaf. Fr. Butua. Ger. Grieswurzel.

Chon-dro-den′dron. Gr. *χόνδρος*, a granule, + *δένδρον*, a tree ; *i. e.*, from the warty protuberances on the bark.

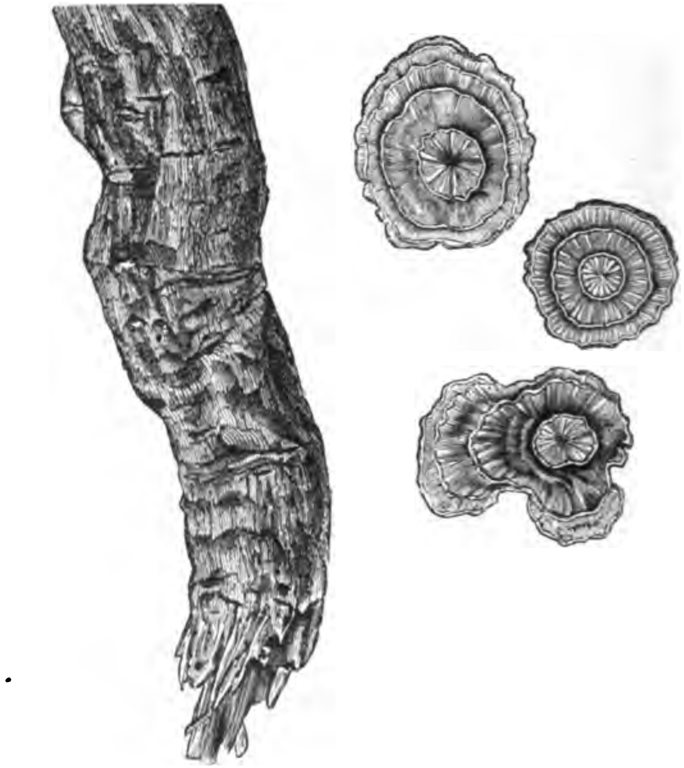
To-men-to′sum. L. *tomentosus*, fr. *tomentum*, woolly ; *i. e.*, under side of the leaves having gray hairs.

Pa-rei′ra-bra′va. Portg. fr. *parreira*, vine, + *brava*, wild ; *i. e.*, from its habit and the appearance of its bunches of fruit.

PLANT.—Tall, woody climber, called natively *Abutua ;* stem 1–10 Cm. (½–4′) thick, bark rough, covered with elevated, elongated prominences ; leaves 12.5–30 Cm. (5–12′) long, on long petioles, ovate, cordate, upper surface smooth, under surface covered with close, fine wool of ashy hue ; flowers diœcious, small, panicles ; fruit purplish-black, drupes, six in a bunch like grapes, each 2.5 Cm. (1′) long, ovoid, 1-seeded. ROOT, in subcylindrical, tortuous pieces 10–15 Cm. (4–6′) long, 2–10 Cm. (¾–4′) thick, brownish-gray with transverse ridges, fissures, and longitudinal furrows ; internally pale-brown, the fresh cut of a waxy lustre ; bark thin ; wood porous, in two or more somewhat irregular concentric circles of 12 wedges, with rather large medullary rays, no distinct central pith ; inodorous ; bitter ; turns inky-bluish-black with tincture of iodine. Bright yellow pieces or those having gray wood, which is hard and nearly tasteless, should be rejected. *Solvents :* alcohol (70 p. c.) ; boiling water. Dose, ʒss–1 (2–4 Gm.).

ADULTERATIONS.—*Roots* of: 1. Common pareira brava (*Cissa'mpelos parei'ra*). 2. Thick false pareira brava. 3. Thin false pareira brava. These have been largely imported and used for the true; they are eccentric and have no waxy internal appearance. 4. White pareira brava (*Abu'ta rufe'scens*). This is concentric, medullary rays dark, interradial spaces white and rich with starch, called natively *Butua*. 5. Yellow pareira brava (*Abu'ta ama'ra*), also eccentric, wood yellow. 6. *Stems* of the official and any of the above-mentioned plants, recognized by being more woody, lighter in color, and having distinct central pith; taste and virtues, however, are similar.

FIG. 129.



Pareira brava; portion of a root and transverse section of the same.

CONSTITUENTS.—Pelosine 0.5 p. c., tannin, ash 4–5 p. c.

Pelosine (Cissampeline), $C_{18}H_{21}NO_3$.—Identical with beberine (*Necta'ndra Rodia'i*), buxine (*Bu'xus sempe'rvirens*) and paricine; it is obtained by boiling the root in acidulated (H_2SO_4) water and precipitating with potassium carbonate; purified by dissolving in water with sulphuric acid, treating with charcoal, precipitating anew with potassium carbonate, and then treating with ether; it is amorphous, yellowish-brown, odorless powder, soluble in alcohol, ether, diluted acids.

Preparations.—1. *Extractum Pareiræ Fluidum.* Fluid Extract of Pareira. (Syn., Br. Extractum Pareiræ Liquidum; Fr. Extrait liquide de Pareira Bravas; Ger. Flüssiges Pareira-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 72 Cc., glycerin 18, water 10, finishing with alcohol 80 p. c., q. s. 100 Cc. Dose ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 10–20 (.6–1.3 Gm.). *Infusion* (U. S. P., 1870, 6 p. c.). Dose, ℥j–2 (30–60 Cc.). *Decoction*, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

Properties.—Diuretic, tonic, laxative. Similar to uva-ursi and chimaphila; it is eliminated by the kidneys, and in passing over the tract acts as a tonic and soothent, especially on the bladder.

Uses.—Cystitis, calculous affections, chronic inflammation and ulceration of the kidneys, gonorrhœa, leucorrhœa, dropsy, rheumatism, jaundice, inflammation of the urinary passages. Used natively for bites of poisonous serpents, the vinous infusion being taken internally and the bruised leaves applied to the wound.

Incompatibles: Ferric and lead salts, tincture of iodine.

Allied Plant:

1. *Cissa'mpelos parei'ra* (Gr. κισσός, ivy, + ἄμπελος, a vine).—W. Indies, C. America. Root and stem 6–25 Mm. (¼–1′) thick, not concentric, wood in 20 porous wedges, separated by narrow medullary rays, bark brownish-gray, suberous; lighter than the official, nonwaxy, and the infusion gives no blue color with tincture of iodine.

CALUMBA. CALUMBA (Columbo).

Jateorrhiza palmata, (*Lamarck*) *Miers.*
(J. Columba, (*Roxburgh*) *Miers.*) } The root.

Habitat. E. Africa, Madagascar (Mozambique and Quilimani forests, along the lower Zambesi River; cultivated in Africa and E. India Islands.

Syn. Kalumb. Foreign Colombo. Colomba. Br. Calumbæ Radix. Fr. Colombo (Calumbé). Ger. Radix Columbo, Colombowurzel.

Jat-e-or-rhi'za. L. fr. Gr. ἰατήρ(ιος), healing, + ῥίζα, a root; *i. e.*, its medical virtues.

Pal-ma'ta. L. *palmatus*, like the open palm of the hand; *i. e.*, the leaves palmately-lobed or divided.

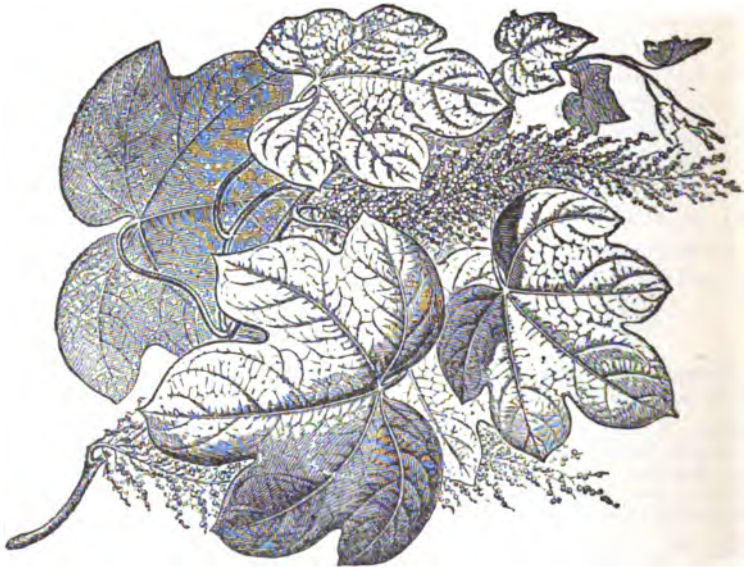
Ca-lum'ba. L. fr. native African name, *kalumb*, hence Colombo in Ceylon, supposed to be the plant's original habitat.

Plant.—Resembles very closely *Menispermum canadense*, hairy, perennial climber, although hispidity varies, reaching the tops of lofty trees; leaves large, 25 Cm. (10′) long, 35 Cm. (14′) wide, orbicular, cordate, 3–5–7-palmately-lobed, lobes entire, wavy, hairy; flowers diœcious, 6's, 12 Mm. (½′) wide; stem grows from short, thick, irregular rhizome; Roots, arise from the rhizome, numerous, fleshy, fasciculated, fusiform, 2.5–10 Cm. (1–4′) thick; these are dug in dry season (March), collected, washed, cut in transverse slices, and dried slowly in the shade. Occurs commercially in circular disks 2.5–6 Cm. (1–2½′) wide, 6–12 Mm. (¼–½′) thick, greenish-brown, wrinkled, centre depressed, internally yellowish, near the cambium gray, wood-bundles project in interrupted circles, distinctly radiate in outer portion, near the blackish cambium line, which separates the bark from the wood; fracture short, mealy; parenchyma contains starch; odor slight; taste aromatic, bitter, mucilaginous. Often more or less worm-eaten.

It enters market from Zanzibar or via Bombay; is controlled by Portuguese, as it was when they held possession of Ceylon. *Solvents:* alcohol (75 p. c.); boiling water extracts most of the virtues (columbin and berberine). Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Roots of *Bryo'nia a'lba* and *Fra'sera Wa'lteri* (American Columbo). These are sometimes dyed yellow with turmeric or safflower, and made bitter with infusion of calumba or quassia, thus making a near resemblance, but recognized by their lighter or slightly off color, absence of dark cambium zone, radiating lines, etc.; the latter also precipitates with iron salts, is not affected by infusion of galls, reddens litmus, evolves ammonia with fixed alkalies, and contains no starch. Occasionally with slices of the stem of *Cosci'nium fenestra'tum*, Ceylon; these are harder, smoother, and not centrally contracted.

FIG. 130.



Jateorrhiza palmata (Columba).

CONSTITUENTS.—Columbin 0.8 p. c., Berberine, Columbic Acid, starch 35 p. c., cholesterin, mucilage, ash 6 p. c.

Columbin, $C_{21}H_{24}O_7$.—Obtained by exhausting root or alcoholic extract with alcohol or ether, evaporating and letting stand several days for crystals to form, which are white, bitter, slightly soluble in water. Dose, gr. ½–1 (.03–.06 Gm.).

Berberine, $C_{20}H_{17}NO_4$.—This is left in mother-liquor from columbin, which is evaporated to dryness, exhausted with boiling alcohol, evaporated, allowed to crystallize upon standing. These two, constituting the drug's activity, may be purified and berberine can be converted into yellow, bitter crystalline salts. The alkaloid is the same as first found in *Berberis vulgaris*, etc. Dose, gr. ½–1 (.03–.06 Gm.).

Columbic Acid, $C_{21}H_{22}O_6 + H_2O$.—Obtained from 3 p. c. oxalic acid infusion by adding baryta and treating precipitate with alcohol; it is in combination with berberine.

Calumba contains no tannin, hence can well be used with iron salts and alkalies as a substitute for gentian, etc.; its infusion or tincture, however, precipitates with infusion of galls or solution of lead acetate.

PREPARATIONS.—*Extractum Calumbæ Fluidum.* Fluid Extract of Calumba. (Syn., Fr. Extrait liquide de Colombo; Ger. Flüssiges Kolombo-Extrakt.)

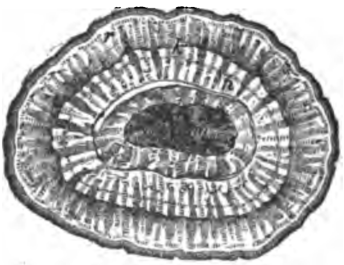
Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏v–30 (.3–2 Gm.).

2. *Tinctura Calumbæ.* Tincture of Calumba. (Syn., Tinctura Colombo; Fr. Teinture de Colombo; Ger. Kolombo-tinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with alcohol 60 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Extract. Dose, gr. 1–5 (.06–.3 Gm.). *Infusion*, 5 p. c. Dose, ℥ss–1 (15–30 Cc.).

FIG. 131.



Calumba. Transverse section, natural size; *r*, bark; *k*, cambium; *h*, wood; *m*, pith (medulla).

PROPERTIES.—Tonic, stomachic, stimulant, increases appetite and digestion by stimulating the gustatory nerves, thereby dilating the gastric vessels and augmenting secretion, does not constipate; externally —antiseptic, disinfectant, anthelmintic.

USES.—Dyspepsia, debility, remittent fevers, dysentery, diarrhœa, cholera morbus, cholera infantum, hectic fever of phthisis, pregnant vomiting, bowel flatus, purging; large doses emeto-cathartic.

Allied Plant:

1. *J. Colum'ba.*—About the same as the official, possibly having a variety difference, in that the basal lobes of leaves are rounded, but do not overlap, and male inflorescence is hispid. In the official variety, once also called *Co'cculus palma'tus*, basal lobes mostly overlap, and male inflorescence is smooth. Our commercial root is collected indiscriminately from both species.

ANAMIRTA. COCCULUS INDICUS.

Picrotoxinum. Picrotoxin, $C_{15}H_{16}O_6 + H_2O$, *official.*

Anamirta Cocculus, (*Linné*) *Wright & Arnott.* (**A. paniculata,** *Colebrooke.*) } A neutral principle obtained from the seeds.

Habitat. E. India (Ceylon, Malayan Islands).

Syn. Fish Berries. India, Oriental Berries. Indian Cockle. Levant Nut. Levant Shell. Fr. Coque du Levant, Picrotoxine. Ger. Kokkelskörner, Pikrotoxin.

An-a-mir′ta. L. fr. Indian name contrasting it with a common Menispermum.
Coc′cu-lus. L. dim. of *coccum*, a kermes berry.
Pa-nic-u-la′ta. L. *panicula*, *paniculatus*, having panicles; *i. e.*, the flowers.
In′di-cus. L. of India.
Pic-ro-tox-i′num. L. fr. Gr. *πικρός*, bitter, + *τοξικόν*, poison; *i. e.*, one of its properties.

Plant.—Large, branching, woody twiner; bark gray; leaves 10–20 Cm. (4–8′) long, cordate, ovate, smooth, pale-green, whitish below, nearly entire; flowers small, diœcious, panicles 20–40 Cm. (8–16′) long, greenish-white; fruit in clusters of 1–5, usually two, drupes, globular, reniform, 12 Mm. ($\frac{1}{2}'$) long, 6 Mm. ($\frac{1}{4}'$) thick, pulp scanty, endocarp thin, brittle, on the concave side projecting deeply into the interior, blackish-brown, wrinkled, basal and apical scars united by a ridge; seeds reniform, oily, bitter, pericarp nearly tasteless; imported from Bombay and Madras. Dose, gr. 1–3 (.06–.2 Gm.).

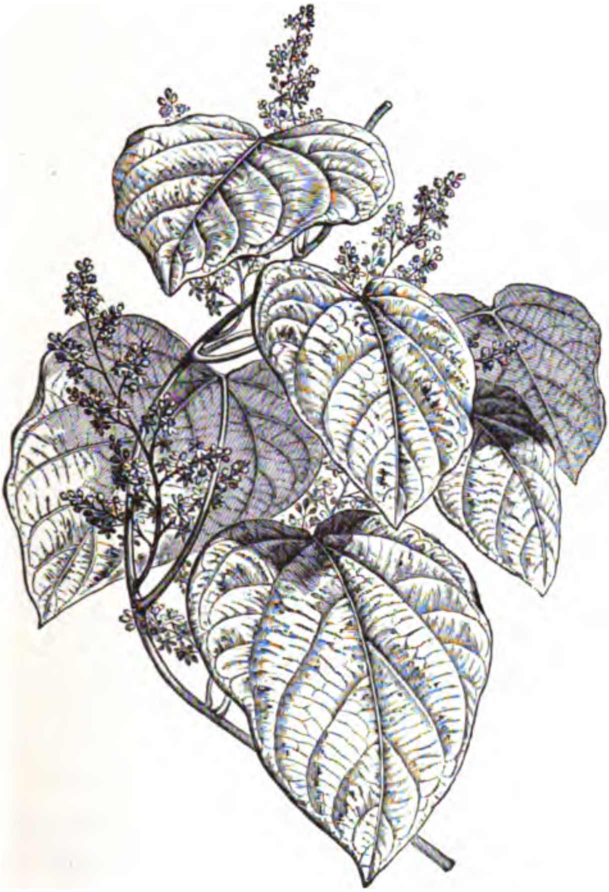
Constituents.—Pericarp: Menispermine (soluble in ether), paramenispermine (insoluble in ether), both tasteless; hypopicrotoxic acid, resin, fat, gum, ash 5 p. c. Seed: Picrotoxin, anamirtin (cocculin, not bitter or poisonous, slightly soluble in chloroform, benzene), fat.

Picrotoxinum. Picrotoxin, $C_{15}H_{16}O_6 + H_2O$.—Obtained by triturating aqueous extract of seeds with magnesia, treating this with hot alcohol, which dissolves picrotoxin, to be deposited on evaporation; or can exhaust seeds with alcohol, evaporate this off, boil residue with water, which takes up picrotoxin, leaving alkaloids and acid behind. As such it is not a single body but two that crystallize together—picrotoxin 55 p. c., picrotin, $C_{15}H_{18}O_7$, 45 p. c.; this latter is non-poisonous and can be separated by its insolubility in benzene or chloroform, the picrotoxin being dissolved thereby. It occurs in colorless, flexible, shining, prismatic crystals or powder, odorless, very bitter, soluble in alkalies or acids, ether, benzol, alcohol, chloroform, slightly so in water. *Tests:* 1. With $H_2SO_4 + NaNO_3 + NaOH =$ brick-red, fading in several hours. 2. Aqueous solution is not affected by tannic acid or mercuric or platinic chloride T. S., or mercuric potassium iodide T. S. (abs. of alkaloids). Dose, gr. $\frac{1}{64}$–$\frac{1}{32}$ (.001–.002 Gm.).

Preparations.—1. Picrotoxin: (Unoff.) *Ointment*, 2 p. c. *Pills*. 2. Seeds: (Unoff.) *Decoction*, 2½ p. c. Dose, ʒj–2 (4–8 Cc.). *Tincture*, 25 p. c. (diluted alcohol). Dose, ♏ij–15 (.13–1 Cc.). *Fluid Extract*. Dose, ♏j–3 (.06–.2 Cc.). Menispermine, $C_{18}H_{24}N_2O_2$. Dose, gr. 1–5 (.06–.3 Gm.).

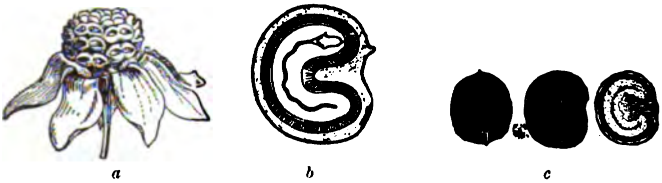
Properties.—Cerebro-spinal excitant, nervine, sedative, antiparasitic. Combines the action of belladonna and nux vomica (strychnine), affecting the medulla oblongata centres, stimulates all secretions—cutaneous, salivary, intestinal, etc.; after temporary acceleration slows the heart and respiration, causes nausea, vomiting, muscular twitching, incoördination, stupor, delirium, ceased diaphragm motion, spasms of the flexors (tonic and clonic alternating), coma, insensibility, death by paralysis of the heart. The convulsions resemble epileptic paroxysms (circular spasms), while those of strychnine are tonic (tetanic) and alone affect the extensors; it is quickly absorbed, and is mainly eliminated by the kidneys, though assisted by the skin.

FIG. 132.



Anamirta Cocculus (paniculata).

FIG. 133.



Anamirta Cocculus; *a*, staminate flower; *b*, longitudinal section of fruit, magnified; *c*, fruit and section, normal size.

USES.—Paralysis (laryngeal), epilepsy, nervous diseases, chorea, eclampsia, night-sweats of phthisis, chronic spasms of the limbs, flatulent colic, intestinal torpor, dyspepsia, vomiting with giddiness, headache, dysmenorrhœa, migraine, morphine antidote; externally: parasitic skin diseases, itch, lice, ring-worm (ointment or tincture of the fruit), being careful to always avoid abraded surfaces.

The berries are used to stupefy fish by throwing them, in powdered form mixed with dough, upon the water. After eating this the fish whirl around, become stupefied, and lie motionless upon the surface, so that they can be readily picked up. They are also used to prevent secondary fermentation of liquors, and to add to their strength, but with danger.

Poisoning: Symptoms and treatment similar to strychnine.

Incompatibles: Chloral hydrate, potassium bromide, motor-depressants, acetic acid, anæsthetics for spasms.

Synergists: All motor-excitants (strychnine, brucine, ergot, etc.).

33. LAURACEÆ. Laurel Family.

La-ra′se-e. L. *Laur-us* + aceæ, bay tree, fr. Celtic *blaur* (= *laur*, the *b* dropped), signifying green, referring to plant's foliage. Trees or shrubs. Distinguished by being aromatic (volatile oils); leaves simple, pellucid-dotted; flowers polygamous, calyx 4–6, in 2 rows, petaloid, regular; stamens perigynous, distinct, anthers opening by 2–4 uplifted valves; ovary 1-celled; ovules 1 in each cell; fruit drupe or berry; tropics, temperate climates; aromatic, stimulant (vol. oil), narcotic, sudorific, tonic, stomachic, febrifuge, astringent; timber, some fruits edible.

Genera: 1. **Sassafras.** 2. **Cinnamomum.**

SASSAFRAS. SASSAFRAS.

1. SASSAFRAS. Sassafras.
2. SASSAFRAS MEDULLA. Sassafras Pith.

Sassafras Sassafras, (*Linné*) *Karsten.* } 1. The bark of the root. 2. The
(**S. variifolium,** *Salisbury.*) } pith of the branches.

Habitat. N. America (Canada, Florida to Texas) in woods, with rich soil.

Syn. Saxifrax, Saloop, Ague Tree, Cinnamon Wood. Br. Sassafras (Cortex) Radix. Fr. Écorce de Sassafras. Ger. Lignum Sassafras, Sassafrashalz, Sassafrasrinde.

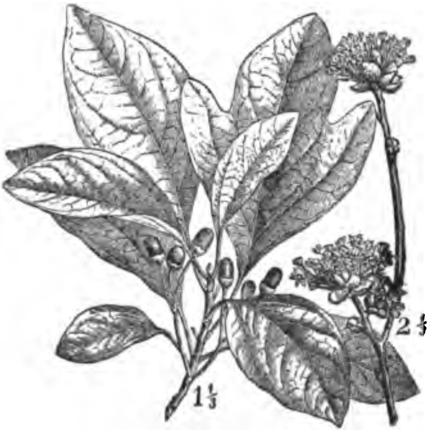
Sas′sa-fras. L. *saxum*, rock, +*frangere*, to break; *i. e.*, grows in crevices of rocks, Sp. for *saxifrage;* name given by Monardes, Spanish botanist, 16th century.

Va-ri-i-fo′li-um. L. *varius*, varying, +*folium*, leaf; *i. e.*, leaves of several forms on the same tree, ovate, entire, three-lobed and cuneate at base.

PLANT.—Occurs as a shrub in the North, but a tree in the South, 9–24 M. (30–80°) high, .3–.6 M. (1–2°) thick; wood whitish or reddish, light, strong, durable, aromatic; bark of stem and large branches rough, deeply furrowed, grayish, young end-twigs smooth, green; leaves 10–15 Cm. (4–6′) long, varying shape; flowers March–May, fragrant, appearing before the leaves, small, greenish-yellow, diœcious, racemes; fruit, oval drupe, size of pea, deep-blue, 1-seeded. BARK OF ROOT (sassafras), in irregular fragments, deprived of gray, corky layer, bright-rust-brown, soft, fragile, fracture short and corky; inside smooth; strongly fragrant; taste sweetish, aromatic, astringent. Collect preferably in autumn, sometimes in spring. *Solvents:* alcohol; hot water. Dose, ʒss–1 (2–4 Gm.). PITH OF BRANCHES (sassafras pith, or medulla), in slender, cylindrical pieces, curved or coiled, light, spongy, white, consisting entirely of parenchyma; inodorous, insipid. Collect in autumn after frost. *Solvents:* macerated in water yields mucilaginous liquid not precipitated by alcohol or lead subacetate. Dose, ʒj–4 (4–15 Gm.).

CONSTITUENTS. — I. BARK: Volatile oil 5 p. c., Sassafrid 9 p. c., tannin 6 p. c., starch, gum, resin, wax. II. PITH: Mucilage.

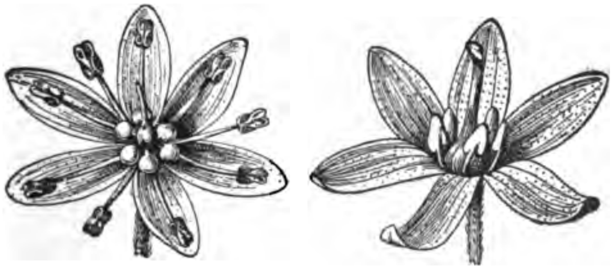
FIG. 134.



Sassafras Sassafras (variifolium); 1, fruiting twig; 2, flowering twig.

Oleum Sassafras. **Oil of Sassafras,** *official.*—(Syn., Fr. Essence de Sassafras; Ger. Sassafrasöl.) This volatile oil is obtained by distilling sassafras (bark) with water or steam; while the bark is preferred, in practice, the whole root is often chipped up and used, yielding only $\frac{1}{5}$ p. c. of unrectified oil. Maryland is the centre of production. It is a yellowish liquid when from root-bark of recently felled trees, reddish from roots of old stumps; with characteristic sassafras odor, without that of camphor; warm, aromatic taste; darkens, thickens by age, sp. gr. 1.080, soluble in alcohol, glacial acetic acid and carbon disulphide. Contains chiefly safrol, $C_{10}H_{10}O_2$, 80 p. c., pinene and phellandrene, $C_{10}H_{16}$, 10 p. c.; dextrogyrate camphor 6.8 p. c., eugenol, $C_{10}H_{12}O_2$, 0.5 p. c., cadinene, residue 3 p. c. *Tests:* 1. Oil + nitric acid each 5 drops gives violent reaction, red color, finally red resin.

FIG. 135.



a *b*

Sassafras Sassafras (variifolium); *a*, staminate flower; *b*, pistillate flower.

2. Oil few drops + sulphuric acid 1 drop gives deep-red color, soon turning blackish. Should be kept dark, in well-stoppered bottles. Dose, ♏j–5 (.06–.3 Cc.).

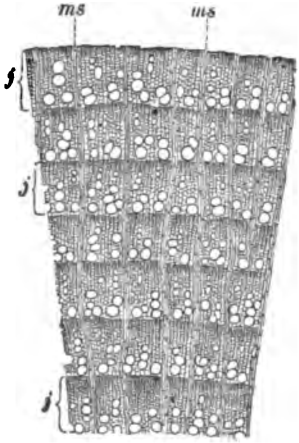
Sassafrid.—Supposed to be altered tannin, the result of oxidation, and is analogous to cinchonic-red; being much more abundant in the fresh than old bark; it is a reddish-brown, inodorous, nearly tasteless powder.

PREPARATIONS.—I. BARK: 1. *Decoctum Sarsaparillæ Compositum*, 2 p. c. Dose, ℥j–4 (30–120 Cc.).

2. *Extractum Sarsaparillæ Fluidum Compositum*, 10 p. c. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ʒss–1 (2–4 Cc.). *Infusion* or *Tea.* Dose, *ad libitum.*

FIG. 136.



Sassafras wood; cross-section, magnified 20 diam.; *j*, annual rings; *ms*, medullary rays.

II. OIL: 1. *Syrupus Sarsaparillæ Compositus*, $\frac{1}{100}$ p. c. Dose, ʒj–4 (4–15 Cc.).

III. PITH: 1. *Mucilago Sassafras Medullæ.* Mucilage of Sassafras Pith. (Syn., Fr. Mucilage de Moëlle de Sassafras; Ger. Sassafrasmark-Schleim.)

Manufacture: 2 p. c. Macerate 2 Gm. in water q. s. 100 Cc. Dose, *ad libitum.* Mostly used externally.

PROPERTIES.—I. BARK: Alterative, diaphoretic, stimulant, emmenagogue.

II. PITH: Demulcent, emollient.

USES.—I. BARK: To purify blood, skin diseases, rheumatism, syphilis. Infusion good antidote for poison-oak, given internally and applied locally; it (tea) was once popular for so called thinning the blood in spring; given with sarsaparilla, guaiacum, etc.

II. OIL: Anodyne, stimulant in neuralgia, to dispel insects; said to neutralize emetic and narcotic effects of tobacco and hyoscyamus, popular as a flavoring agent in confectionery, drinks, soaps, etc.

III. PITH: Mostly in collyria for conjunctivitis, acute gastritis, dysentery, febrile affections, throat trouble, in poisoning by corrosives; used to suspend insoluble substances and for flavoring.

Allied Plants:

1. *Umbellula'ria califo'rnica, California Bay Laurel* or *Spice Tree.*—Wood brownish, close-grained, esteemed for cabinet work; leaves yield volatile oil 4 p. c., with nutmeg and cardamom odor; seeds contain a fat; stimulant, anodyne in diarrhœa, neuralgia, headache.

2. *Sassafras Lignum, Sassafras Wood.*—Contains little volatile oil; used like the bark, but very weak medicinally.

CINNAMOMUM. CINNAMON.

1. Cinnamomum Cassia. Cassia Cinnamon.

Cinnamomum aromaticum, *Nees.* } The bark of the shoots, (of one or more undetermined species, grown in China).

2. Cinnamomum Saigonicum. Saigon Cinnamon.

Cinnamomum species unnamed. } The bark of an undetermined species.

3. Cinnamomum Zeylanicum. Ceylon Cinnamon.

Cinnamomum zeylanicum, *Nees.* } The inner bark of the shoots.

Habitat. 1. China, Anam. 2. Anam (Cochin China). 3. Ceylon. All cultivated in Java. Sumatra, South America, W. Indies.

Syn. 1. Cinnamomum, Cassia Bark (U. S. P., 1880), Chinese (Cinnamon) Cassia, Cassia (Flower) Tree, Lignea or Cinnamomea, Cinnamomum Chinense. Fr. Cannelle de Chine, Casse. Ger. Cortex Cinnamomi, Chinesischer Zimmt, Zimmtkassie. 2. Cortex Cinnamomi Saigonici. Fr. Cannelle de Saigon. Ger. Saigonzimmt. 3. Cinnamomum (U. S. P., 1880). Br. True Ceylon Cinnamon, Cinnamomi Cortex, True or Suet Cinnamon, Cinnamomum (acutum) verum. Fr. Cannelle de Ceylon. Ger. Zeylonzimmt, Brauner Canel.

Cin-na-mo′mum. L. fr. Ar. *kinnamon*, cinnamon, probably connected with *qaneh*, a reed, cane; *i. e.*, resemblance of stems, or Malay *kaju manis*, sweet wood, from its aromatic odor and taste.

Cas′si-a. L. fr. Heb. *qetsioth*, *qatsa*, to cut, peel off; *i. e.*, the bark.

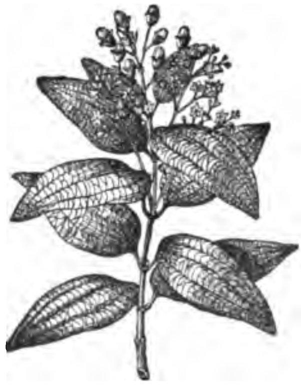
Ar-o-mat′i-cum. L. *aromaticus*, fragrant; *i. e.*, its odor.

Sa-i-gon′i-cum. L. belonging to Saigon, a country and city in Southern Anam; *i. e.*, its native habitat.

Ze-y-lan′i-cum. L. belonging to Ceylon; *i. e.*, its habitat.

Plants.—Handsome evergreen trees 6–9 M. (20–30°) high, trunk .3–.5 M. (12–18′) thick, young twigs slightly quadrangular; leaves coriaceous, 3–5-nerved, but only midrib reaching apex, bright-glossy-green above, glaucous beneath, 10–20 Cm. (4–8′) long; flowers Jan.–March, small, hermaphrodite or polygamous, producing fleshy, black, ovoid fruit, which adheres like the acorn to the cup-shaped perianth, size of small olive. Bark: 1. *Chinese Cassia* (*Cinnamon*). In single, rarely double quills, 6–25 Mm. ($\frac{1}{4}$–1′) wide, about 2 Mm. ($\frac{1}{12}$′) thick, variable length, deprived of corky layer, yellowish-brown, outside rough, fracture smoothish; odor fragrant; taste sweet, warmly aromatic, less sweet, delicate, more bitter, astringent and pungent than Ceylon; contains fewer bast-fibres, more mucilage-cells, at the same time some specimens are equally as fine and delicate; thought to be mostly from *C. aroma′ticum.* The "Cassia lignea" is a poor grade, the rolls "false packed." with broken bark, waste matter, and often sand, in the interior.

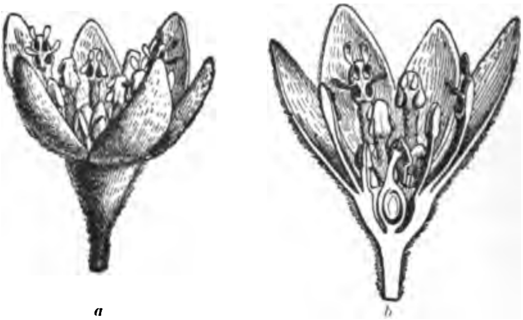
Fig. 137.



Cinnamon twig, showing leaf venation.

2. *Saigon, Anam Cassia* (*Cinnamon*). This is the best quality and highest priced Chinese bark; it is cultivated largely in Anam, and to some extent around the capital (Saigon) of French Cochin China, mostly from *C. Loureirii* (after Loureiro, celebrated botanist). The intermediate sized bark is frequently sweeter, stronger, but less permanent in odor than Ceylon, producing sweeter and less pungent oil; occurs in unscraped quills (not deprived of corky layer), 25 Cm. (10′) long, 12 Mm. ($\frac{1}{2}$′) wide, 2–6 Mm. ($\frac{1}{12}$–$\frac{1}{4}$′) thick, often very much broken, grayish-brown outside, warty, transverse ridges, longitudinal wrinkles, inside darkish-brown, granular, striate, fracture short; odor fragrant; taste sweet, warmly aromatic, slightly astringent. Although like the cassia, inclined somewhat to increase astringency with age, even the thickest bark is very often of the first quality.
3. *Ceylon Cinnamon.* This is only the liber, occurs in closely rolled quills of eight or more layers of bark the thickness of paper, .3–1 M. (1–3°) long, pale-brown, outside smooth, but marked with wavy lines of bast-bundles, inner surface striate, fracture short-splintery; odor fragrant; taste sweet, slightly astringent, warmly aromatic; when distilled yields $\frac{1}{2}$–1 p. c. volatile oil (less than two preceding—$\frac{1}{2}$–1$\frac{1}{2}$ p. c.), the most delicate of all, only approximated by the finer grades of other kinds. *Solvents:* alcohol; hot water partially. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 138.

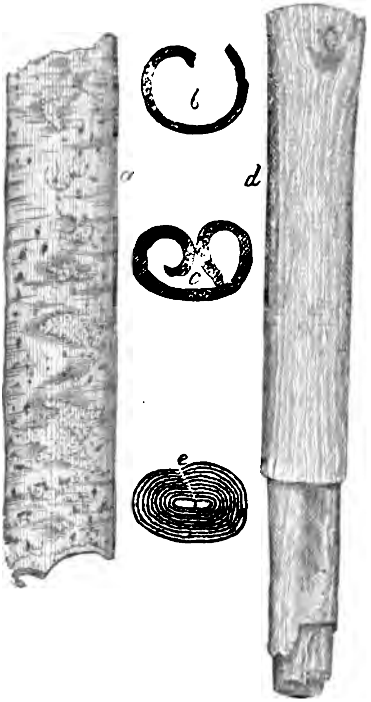


Cinnamomum; *a*, flower; *b*, vertical section of the same.

ADULTERATIONS.—1. Barks of many allied species, inferior cassia bark, thick, dark colored. 2. Clove bark; quills 18–36 Mm. ($\frac{3}{4}$–1$\frac{1}{2}$′) thick, 5 Cm. (2′) long, composed of 6–10 pieces rolled together; odor clove-like; taste cinnamon-like. Clove buds are larger than cassia buds.

Commercial.—Cinnamon was a very early favorite spice, being brought by Arabian navigators to the Phœnicians, Grecians and Romans. The Chinese cassia was first used; Ceylon not until 1275. Grows wild, but mostly cultivated; this was formerly done most successfully in Ceylon, where now coffee replaces it, so that at present around Colombo the principal cinnamon gardens exist. Many species contribute our official bark, as *C. aroma'ticum, C. zeyla'nicum, C. Loureiʹrii, C. i'ners* (wild Japan cinnamon), *C. ni'tidum* (Ceylon, Java), *C. Culi'laban*, and var. *ru'brum* (Moluccas), *C. Si'ntok* (Java, Sumatra), *C. kia'mis* (Massoy bark). In Bengal mountains have *C. obtusifo'lium, C. pauciflo'rum, C. Burma'nni, C. Ta'mala.* These and others furnish the bark shipped from Calcutta, Java, Timor, etc., under names *Cassia lignea, Cassia, Cassia vera, Wild Cassia*, etc., which are distinguished from Ceylon bark by yielding much mucilage with water. Plantations are cultivated by planting seeds in prepared soil, 4–5 in each hill; in six or seven years these produce stems 1.5–3 M. (5–10°) high, straight from continued pruning, when they are cut down with catty-knives, and, by coppicing, a new crop of twigs is formed every two or three years. The barking (March–June, after which delicacy and aroma lessen) is done under cover by making two equi-distant longitudinal slits and transverse ones every few feet apart, then by mama-knife it is easily teased off; after allowing several days for partial fermentation to facilitate epidermal separation, it is laid concave downward upon a convex piece of wood and scraped with curved knives or entire epidermis removed with planes. Congeries of quills are formed, which, when dried (first by shade, then by sun), are made into 30-pound (14 Kg.) bundles and marketed as to quality in *firsts, seconds, thirds*, the inferior grades being distilled for oil. The varieties of these barks are several: 1. *Cassia* = Chinese, Saigon, Calcutta, Java, Timor, Padang, Sumatra. 2. *Cinnamon* = Ceylon, Malabar or Tinnevelly, Tellicherry, Java. These are imported loose or in bundles with split bamboo bands from Canton, Hong Kong (Saigon), Calcutta, Colombo.

FIG. 139.



Cinnamon; *a, b, c*, from China; *d, e*, from Ceylon.

CONSTITUENTS.—Volatile oil ½–2 p. c., tannin, sugar, mannit, starch, mucilage, ash 2–5 p. c.

Oleum Cinnamomi. Oil of Cinnamon, *official*.—(Syn., Oil of Cassia, Oil of Ceylon Cinnamon, Oleum Cinnamomi Zeylanici; Fr. (Essence) Huile de Cannelle; Ger. Zimmtöl, Zeylonisches Zimmtöl.) This volatile oil, obtained by distilling Cassia cinnamon, is a brownish liquid, that darkens and thickens by age; odor characteristic, taste sweet, spicy, burning, sp. gr. 1.060, soluble in equal quantities alcohol, glacial acetic acid, when shaken with solution sodium bisulphite solidifies to crystalline mass. Consists chiefly, 75 p. c., of cinnamic aldehyde, C_9H_8O (oxidizing into resin and cinnamic acid), but has cinnamyl acetate, $C_9H_9—C_2H_3O_2$, and hydrocarbons. Fresh oil contains no cinnamic acid, and after this is formed, by further oxidation it becomes benzoic acid. Should be kept cool, dark, in well-stoppered bottles. *Tests:* 1. Oil shaken with water, the clear filtrate + few drops of basic lead acetate T. S., should give white turbidity, without yellow color (abs. oil of cloves). 2. Oil 4 drops + alcohol 10 Cc. + 1 drop of ferric chloride T. S., should give brown, not green or blue color (abs. oil of cloves, carbolic acid). The Ger. and U. S. P. recognize only oil of Chinese cinnamon, while the Br. Phar. and Fr. Codex that of Ceylon cinnamon; the former is more abundant, cheaper, the latter finer flavor, more delicate aroma, containing besides cinnamic aldehyde, some eugenol and phellandrene. Dose, ♏j–5 (.06–.3 Cc.).

ADULTERATIONS.—Oil distilled from flowers and roots, carbolic acid, oil of cloves, petroleum, colophony.

PREPARATIONS.—I. CASSIA BARK: 1. *Tinctura Cardamomi Composita*, 2 p. c. Dose, ʒj–2 (4–8 Cc.).

2. *Tinctura Catechu Composita*, 5 p. c. Dose, ʒss–2 (2–8 Cc.).

3. *Tinctura Lavandulæ Composita*, 2 p. c. Dose, ʒss–1 (2–4 Cc.).

4. *Vinum Opii*, 1 p. c. Dose, ♏v–20 (.3–1.3 Cc.).

II. CEYLON BARK: 1. *Pulvis Aromaticus.* Aromatic Powder. (Syn., Br. Pulvis Cinnamomi Compositus, Compound Powder of Cinnamon; Fr. Poudre Aromatique, Poudres des (Épices) Aromates; Ger. Aromatisches Pulver, Gewürzpulver.)

Manufacture: 35 p. c. Ceylon cinnamon 35 Gm., ginger 35, cardamom 15, nutmeg 15. Dose, gr. 10–30 (.6–2 Gm.).

Prep.: 1. *Extractum Aromaticum Fluidum.* Aromatic Fluid Extract. (Syn., Extrait liquide Aromatique des Aromates; Ger. Flüssiges (Gewürz) Aromatisches-Extrakt.)

Manufacture: Macerate, percolate aromatic powder 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

2. *Tinctura Cinnamomi.* Tincture of Cinnamon. (Syn., Fr. Teinture de Cannelle; Ger. Zimmt-tinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with glycerin 5 Cc. alcohol 75, water 20, finishing with alcohol 75 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

III. OIL: 1. *Aqua Cinnamomi.* Cinnamon Water. (Syn., Fr. Eau de Cannelle; Ger. (Einfaches) Zimmtwasser.)

Manufacture: $\frac{1}{5}$ p. c. Triturate oil .2 Cc. with precipitated calcium phosphate .4 Gm., water q. s. 100 Cc. Dose, ℥ss–1 (15–30 Cc.).

Prep.: 1. *Infusum Digitalis*, 1.5 p. c. Dose, ℥ss–1 (15–30 Cc.).

2. *Spiritus Cinnamomi.* Spirit of Cinnamon. (Syn., Fr. Alcoolat de Cannelle; Ger. Zimmtspiritus.)

AURACEÆ.

Manufacture: 10 p. c. Dissolve oil 10 Cc. in alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Unoff. Preps. BARK: *Fluid Extract.* Dose, ♏v–30 (.3–2 Cc.). *Syrup* (bark 10, water 50, sugar 60), for flavoring. *Infusion.* Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Carminative, stomachic, stimulant, astringent, hæmostatic, aromatic, antispasmodic, germicide. The oil has no astringency.

USES.—Diarrhœa, flatulence, nausea, vomiting, menorrhagia, parturient, to check griping medicines, for flavoring preparations, chocolate, etc.

CAMPHORA. CAMPHOR.

Cinnamomum Camphora, (*Linné*) *Nees et Ebermaier.* } A stearopten (concrete volatile oil), of a ketone nature, purified by sublimation.

Habitat. China, Japan, Formosa. Tree cultivated in Italy as an ornament, and may yield profitably in California, Florida, etc., wherever frosts are light.

Syn. Camphor Laurel, Gum Camphor Tree. Fr. Camphre. Ger. Kampher, Kampfer, Campher.

Cam'pho-ra. L. fr. Ar. *kafur* or *kapur*, chalk, lime; *i. e.*, its resemblance.

PLANT.—A tree 9 M. (30°) high, much branched, resembles the Linden, growing up to 600 M. (2,000°) elevation in tropics—Cape Good Hope, Brazil, Jamaica, Madeira, Mediterranean region, etc.; bark smooth, green; leaves evergreen, 7.5–15 Cm. (3–6′) long, 2.5–7.5 Cm. (1–3′) wide, attenuated toward both ends, entire, glaucous beneath, thick; flowers June–July, small, whitish; fruit, November–December, purple berry, 6 Mm. (¼′) thick, 1-seeded. STEAROPTEN (camphor), in white, translucent masses, tough, crystalline, easily powdered with a little alcohol, chloroform or ether; odor aromatic, characteristic; taste pungent, aromatic; sp. gr. 0.995; soluble in alcohol, ether, chloroform, carbon disulphide, benzin, fixed and volatile oils, slightly in water; liquefied with equal quantities of menthol, thymol, phenol, or chloral hydrate; volatile, inflammable, sublimable without residue. Dose, gr. 2–10 (.13–.6 Gm.).

Commercial.—While all parts of the tree contain camphor, it is only obtained from the root, trunk, and branches by sublimation.

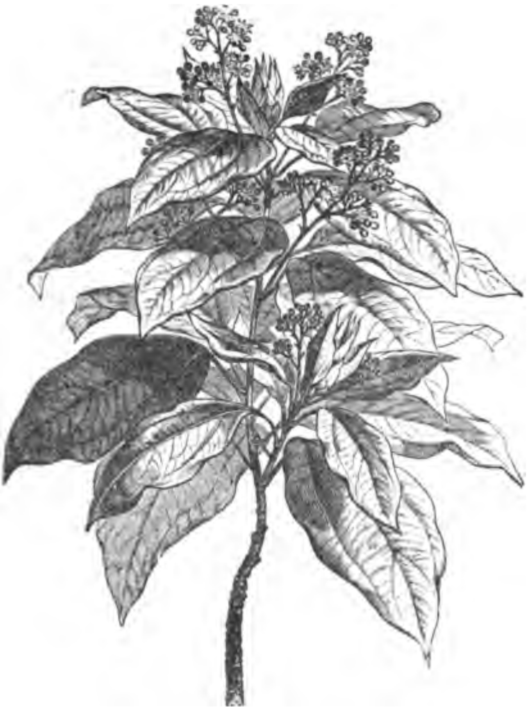
1. *In Japan* roots and small branches are chipped and put with a little water into large iron vessels surmounted with earthen domes, lined with rice-straw. Upon applying moderate heat, camphor, volatilized by steam, rises to the domes and condenses on the straw, from which it is shaken and packed in double-tubs, 100 pounds (45 Kg.) each. This is larger grained, lighter-pink, cleaner, dryer, and higher priced than Chinese variety.

2. *In China* the comminuted plant is boiled in water until the camphor adheres to the ladle, when the strained liquid upon cooling concretes; this latter, with alternating layers of earth, is now sublimed.

3. *In Formosa Island* the chips are exposed to steam, which, taking it up, deposits it in reversed pots upon condensation. A large wooden trough, coated with clay, surmounts a furnace, water is poured into the

trough, a perforated board is luted to the top, upon which chips are placed, being covered with inverted earthen pots. When heat applied steam is produced, which, rising, passes through the openings, and also chips, thus becoming camphor-vapor, which condenses on inside of pots, from which it is scraped daily and forwarded to Tamsui, Takow, etc., in baskets 70 pounds (32 Kg.) each. In these Formosa ports it is stored in vats or packed in chests, tubs (lead or tin lined) of 100 pounds (45 Kg.) each, and before shipping is saturated with water, to prevent evaporation in transit, thereby loss of weight, hence usually reaches us moist. When stored in vats a yellowish-brown volatile oil — camphor oil — drains out, which may be increased in amount by pressure.

FIG. 140.



Cinnamomum Camphora.

ADULTERATIONS. — As obtained thus may have impurities 2–10 p. c., — vegetable matter, gypsum salt, sulphur, chips, etc.

Refining. — To remove such foreign material crude camphor is mixed with $\frac{1}{50}$ part of quicklime (iron filings, sand, or charcoal), then resublimed at 204° C. (400° F.), in iron, copper, or glass retorts; this was formerly done exclusively in Europe, but now largely in this country; the lime removes resin, empyreumatic oil, moisture, etc. When thus purified it is pressed into various-shaped blocks. We have two commercial varieties: 1. *Japan, Tub, Dutch* (they being the first to introduce it), usually from Batavia. 2. *China, Formosa;* this is the cheapest, most abundant, sometimes contains ammonium chloride, usually from Canton.

CONSTITUENTS.—$C_{10}H_{16}O$. When heated with zinc chloride yields cymol, $C_{10}H_{14}$; with nitric acid yields camphoric acid, $C_{10}H_{16}O_4$, and camphoronic acid, $C_9H_{12}O_5$; the former acid forms colorless, inodorless prisms, melting at 180° C. (356° F.), soluble in alcohol, slightly in water, insoluble in carbon disulphide; the latter acid melts at 136° C. (277° F.) with decomposition and is freely soluble in water, or alcohol.

PREPARATIONS.—1. *Aqua Camphoræ.* Camphor Water. (Syn., Aqua Camphorata; Br. Mistura Camphoræ; Fr. Eau Camphré; Ger. Kampherwasser.)

Manufacture: $\frac{4}{5}$ p. c. Triturate .8 Gm. with precipitated calcium phosphate .5, alcohol .5 Cc., distilled water q. s. 100 Cc. Dose, ʒj–8 (4–30 Cc.).

2. *Linimentum Camphoræ.* Camphor Liniment. (Syn., Camphorated Oil, Linimentum Camphoratum; Fr. (Liniment) Huile Camphré; Ger. Oleum Camphoratum, Kampheröl, Kampher-liniment.)

Manufacture: 20 p. c. Dissolve 20 Gm. in hot cottonseed oil q. s. 100 Cc.

Prep.: 1. *Ceratum Camphoræ.* Camphor Cerate. (Syn., Fr. Unguentum (Pomatum) Camphoratum, Pommade Camphré; Ger. Kamphersalbe.)

Manufacture: Camphor liniment, 10 Gm., white wax 30, lard 60; melt two latter with gentle heat, add former, stir until cold.

3. *Spiritus Camphoræ.* Spirit of Camphor. (Syn., Tinctura Camphoræ, Tincture of Camphor; Fr. Alcohol Camphoratus, (Esprit de) Alcool Camphré; Ger. Spiritus Camphoratus, Kampherspiritus.)

Manufacture: 10 p. c. Dissolve 10 Gm. in alcohol q. s. 100 Cc. Dose, ♏v–60 (.3–4 Cc.).

4. *Linimentum Belladonnæ,* 5 p. c.
5. *Linimentum Saponis,* 4.5 p. c.
6. *Linimentum Sinapis Compositum,* 6 p. c.
7. *Pulvis Morphinæ Compositus,* 32 p. c. Dose, gr. 5–10 (.3–.6 Gm.).
8. *Tinctura Opii Camphorata,* $\frac{2}{5}$ p. c. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Ointment, Vinum Camphoratum. Chloral Camphoratum (each 50 p. c.). *Camphora Phenolata. Camphora Salicylata,* etc. Enters largely into dentifrices, camphor-ice, etc.

PROPERTIES.—Antispasmodic, stimulant, carminative, stomachic, (an)aphrodisiac, antipyretic, nervine, sedative, diaphoretic, rubefacient, resolvent, antiseptic. Has great healing powers; dilates vessels, increases flow of gastric juice and peristalsis. Large doses cause burning, vomiting, weak pulse, giddiness, debility, pallor, cold skin, faintness, confused ideas, delirium, convulsions, death from collapse; does not kill healthy adults.

USES.—Camphor was not known to Greeks or Romans, we having derived it from the Arabians, who use it solely as a refrigerant and to lessen sexuality. Now employed in hysteria, dysmenorrhœa, nervousness, diarrhœa, colic, flatulence, rheumatism, gout, tenesmus, asthma, cough, coryza, toothache, headache, spasms, chorea, epilepsy, typhoid condition, mania. Externally as a wash, liniment or ointment for ulcers, gangrene, scabies, sprains, bruises, rheumatic pains, convulsions.

Poisoning: Must vomit, then give alcohol in small but frequent doses, coffee, cold, arterial sedatives; opium and bromides for the convulsions.

Incompatibles: Aconite, acids, neutral salts, water precipitates all solutions.

Synergists: Antispasmodics, alcohol, opium, narcotics, aromatics, all in small quantity.

Allied Products:

1. **Camphora Monobromata. Monobromated Camphor,** $C_{10}H_{15}BrO$, *official.*—(Syn., Bromated (Brominated) Camphor, Brom-Camphor; Fr. Camphré Monobromé; Ger. Monobrom (Kampher) Camphor.)

Manufacture: Heat in a sealed tube, on water bath, bromine and camphor in molecular proportions (preferably with a little alcohol, water or chloroform) until reaction ceases, wash crystalline mass with water, recrystallize from alcohol, or benzin. It occurs in colorless, prismatic needles or scales, having mild camphoraceous odor and taste, permanent, soluble in alcohol, ether, chloroform, hot benzin, fixed and volatile oils, insoluble in water, volatile without residue at 274° C. (525° F.). Soluble without decomposition in sulphuric acid from which it separates unaltered when thrown into water. Dose, gr. 2–5 (.13–.3 Gm.), in pill or emulsion.

USES.—Delirium tremens, hysteria, convulsions, coughs, insomnia, spermatorrhœa. To make emulsion, add to it six times its weight of oil of sweet-almond and emulsify this with acacia.

2. *Borneo, Sumatra* or *Barus Camphor* (*Dryoba'lanops aroma'tica* (*Ca'mphora*)), $C_{10}H_{18}O$, has different odor from official camphor, heavier than water, less volatile, with nitric acid yields ordinary camphor.

3. *Ngai Camphor* (*Blu'mea balsami'fera*).—This is a tall weed of India, China, Formosa. Its camphor has same composition as Borneo, but is levogyre, and natively is prized higher than our official.

4. *Artificial Camphor.*—Although this can be made by oxidizing camphene, $C_{10}H_{16}$, with chromic acid mixture, yet the products terpin hydrate and terpene hydrochlorate are generally recognized under this name; the latter being prepared by saturating oil of turpentine, dissolved in twice its volume of carbon disulphide, with hydrochloric acid gas.

5. *Oleum Camphoræ, Camphor Oil,* official, 1870–1880.—This is a yellowish-brown volatile oil obtained from camphor by sublimation and expression; has camphor odor and taste, sp. gr. 0.940, dextrogyre. Consists of pinene, phellandrene, cineol, dipentene, terpineol, safrol, eugenol, cadinene, and at low temperature deposits camphor.

Allied Plants:

1. *Nectandra Rodiœi, Bebeeru Bark.*—The bark official, 1860–1880, S. America. Large tree, 18–24 M. (60–80°) high, bark ash-gray, smooth, leaves 12.5–15 Cm. (5–6′) long, 5–7.5 Cm. (2–3′) wide, coriaceous, shining; flowers yellowish-white, jasmine odor, wood strong (valuable in ship building); fruit, subpyriform, 5–7.5 Cm. (2–3′) long, bitter. Bark flat pieces 6 Mm. (¼′) thick, .3–.6 M. (1–2°) long, 10–15 Cm. (4–6′) wide, many longitudinal depressions, inside cinnamon-brown, coarsely striate, fracture granular, with stone-cells, astringent, bitter. Contains beberine (identical with buxine and

pelosine), sipirine; wood has nectandrine. Used as tonic, antiperiodic, febrifuge for intermittents, menorrhagia, leucorrhœa, headache, neuralgia, dyspepsia, consumption, in infusion, decoction. Dose, ʒss–1 (2–4 Gm.). Beberine, gr. 1–10 (.06–.6 Gm.).

2. *Coto Bark.*—Bolivia. May be from *Dri'mys Wi'nteri* var. *granate'nsis.* In flat or curved pieces 12 Mm. (½′) thick, cinnamon color and odor, taste pungent, bitter. Contains cotoin, $C_{22}H_{18}O_6$, volatile oil, resin. Dose, gr. 5–10 (.3–.6 Gm.). Cotoin, gr. ¾–2 (.05–.13 Gm.).

3. *Para-coto Bark.*—Bolivia. 12 Mm. (½′) thick, sometimes with white fissured cork, odor nutmeg-like. Contains paracotoin, $C_{19}H_{12}O_6$, hydrocotoin, volatile oil, resin. Used like coto bark for diarrhœa of typhoid, phthisis, sweating, cholera, nasal catarrh. Dose, gr. 5–10 (.3–.6 Gm.), tincture 10 p. c. (alcohol), ʒss–1 (2–4 Cc.), paracotoin gr. 1–5 (.06–.3 Gm.).

4. *Be'nzoin (Li'ndera) Benzoin, Spice* or *Benjamin Bush.*—N. America, damp woods. Shrub 2–4.5 M. (6–15°) high, smooth; bark mostly used, berries and leaves to some extent; tonic, aromatic stimulant, diaphoretic; berries for allspice. Dose, gr. 15–60 (1–4 Gm.).

5. *La'urus no'bilis, Laurel, Sweet Bay.*—Mediterranean Basin. Leaves 5–10 Cm. (2–4′) long, pellucid-punctate, smooth, aromatic, astringent; fruit (bayberries) oval drupes 12 Mm. (½′) long. Contains volatile oil, fixed oil (Oleum Lauri) 30 p. c., stimulant, astringent, stomachic.

34. PAPAVERACEÆ. Poppy Family.

Pa-pav-e-ra'se-e. L. *Papaver* + aceæ, poppy, OE. *papy*, Gr. *μήκων*, classic name, fr. *papa*, pap or thick milk; formerly used for children, to nourish and cause sleep. Herbs or shrubs, with milky or colored juice. Distinguished by the 2–3 fugacious sepals and minute embryo near base of fleshy albumin; flowers large, in 2's or 4's; petals 4–12; stamens 16 +; ovary compound, 1-celled; anthers 2-celled, superior; fruit capsule; temperate climates; narcotic, emetic, cathartic, acrid poison.

Genera: 1. **Papaver.** 2. **Sanguinaria.** 3. **Chelidonium.**

OPIUM. OPIUM.

Papaver somniferum, *Linné.* } The concrete milky exudation, obtained by incising the unripe capsules, yielding not less than 9 p. c. crystallized morphine.

Habitat. W. Asia (Asia Minor, Persia, China, Africa, India, Italy, Greece, England, United States, cultivated).

Syn. Opium Poppy. Poppy. Black, Blue, or Maw Seed Poppy. Meconium. Succus Thebaicus. Thebaica. Fr. Opium. Ger. Opium. Mohnsaft.

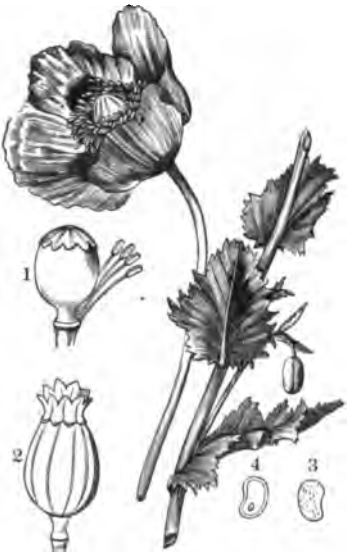
Pa-pa'ver. See etymology, above, of Papaveraceæ.

Som-nif'er-um. L. *somnus*, sleep, + *ferre*, to bring; *i. e.*, produces sleep.

O'pi-um. L. fr. Gr. *ὄπιον*, poppy or vegetable juice.

PLANT (var. *a'lbum*).—An annual with thick, branching, yellow root; stem .6–1.3 M. (2–4°) high, 12 Mm. (½′) thick, smooth, glaucous, branched; leaves 15–25 Cm. (6–10′) long, sessile, oval, tapering at base, variously-lobed and toothed, thick, dull-green, glaucous, veins prominent, midrib wide, white; flowers February–March, few, large, 7.5–17.5 Cm. (3–7′) wide, terminal, silver-gray; sepals 2, green; petals 4, white, yellow, violet; fruit capsule, 3–4 on each plant, nearly globular, 2.5–7.5 Cm. (1–3′) wide, flat top and bottom, with neck smooth, glaucous, pericarp yellowish, dehiscing by small apertures beneath the stigmatic crown. JUICE (opium), in irregular or subglobular cakes, with remnants of poppy leaves and *Rumex* fruits on surface, plastic or harder, brownish, somewhat shining; internally showing tears and vegetable tissue fragments; odor sharp, narcotic; taste peculiar, bitter. *Solvents:* diluted alcohol; diluted acids; boiling water. Dose, gr. 1–2 (.06–.13 Gm.).

FIG. 141.



Papaver somniferum; 1, ovary with few remaining stamens; 2, ripened capsule; 3, seed; 4, longitudinal section of seed.

ADULTERATIONS.—Sand, bullets, stones, pounded poppy capsules, gum tragacanth, resins, wax, liquorice, pitch, starch, sugar, camels' dung, pulp of figs or apricots, acacia, molasses, clay, shot, ashes, gypsum, litharge, charcoal, leaves, stems, moisture, exhausted opium.

Commercial.—Homer mentions the poppy as a cultivated garden plant, and even now it is raised for its ornamental flowers. Usually it does not grow wild, but is planted similar to wheat (Sept.–Oct.), requiring rich soil, manure, and care until the yielding stage. Under cultivation several varieties have developed, all being useful. Var. *album* is preferred; var. *nigrum* has purple or red flowers, smaller, rounder capsules, and black seeds (hence its variety name). All parts of the plant yield milky juice, but the leaves and seeds are without alkaloids, the former natively being used as spinage, the latter for its 50–60 p. c. of bland yellow oil, which is employed in culinary, pharmacy, etc., instead of olive oil. The plant grows well in our Southern States (Va., S. Ca., Ga., Tenn., etc.), wherever winter snows do not prevail, and the juice develops some narcotic properties at the flowering period.

Opium, however, is collected mainly in Asia Minor, Egypt, etc., May–July, by making, into the unripe capsule, a few days after the flower falls, one or more transverse or spiral incisions (longitudinal in Japan, India), with a several-bladed knife (*nushtur*), carefully avoiding cutting through the inner capsular diaphragm, in which case juice would be lost by escaping into the centre of the capsule, thereby destroying also the seeds, as well as possibly injuring the plant. Men, women, and children do the incising in the afternoon, whereupon a white juice exudes which soon concretes into tears. By next morning this is brown, when it is scraped off with knives on to poppy or *Rumex* leaves, wetting the knives occasionally with saliva or oil to prevent adherence. When full the leaves are folded, wrapped with fresh leaves if necessary, and dried for several days in the shade. Small growers sell their product to interior merchants, who pack it in bags with *Rumex* berries to prevent sticking. These are sealed, put into baskets, and forwarded to Smyrna, Constantinople, etc., where it is sold upon physical examination; it is then transferred to buyers' underground warehouses, where it is cured or doctored. The growers sometimes manipulate the tears into a homogeneous mass with mortar and pestle, giving *homogeneous opium* (Egypt, India); or more frequently the separate masses are merely pressed together as agglutinated tears, yielding *granular opium* (Asia Minor, Persia); or an aqueous extract of spent capsules and leaves may be mixed with the pure juice.

The most important commercial varieties are:

1. *Turkey, Asia Minor* (*P. somni'ferum* var. *a'lbum* and *gla'brum*).—(*a*) Smyrna: best, most common in our market in round or flat lumps ½–2 lbs. (.2–1 Kg.), with tears like seeds on the inside, hence has not been manipulated or kneaded; yield 10–13 p. c. morphine. (*b*) Constantinople: resembles Smyrna, only has no tears, and like it, also comes from the northern opium districts of Anatolia, in round or flat lumps ½–3 lbs. (.2–1.2 Kg.); yield 10–13 p. c. morphine. From this port also come the rich opiums of Gévé, Magnesia, Salonica, Bithynia, Amasia, Malatia, in 1–5 oz. (.03–.15 Kg.) packages.

2. *Egyptian* (*P. somni'ferum* var. *gla'brum*).—In flat, roundish cakes 2.5–15 Cm. (1–6′) wide, 2–16 oz. (.06–.5 Kg.); has no *Rumex* capsules; brittle, not tenacious like the Smyrna; hard in the centre as on the surface, fracture conchoidal, waxy lustre, redder than Smyrna; yield 6–7 p. c. morphine.

3. *India.*—Seldom reaches our market, but mostly exported to China; in round balls, 4 lbs. (2 Kg.), with 12 Mm. (½′) outside, hard coating of leaves and poppy petals agglutinated with extract of juice and washings, then dried—*Provision opium;* or moulded into flat, square, or in circular cakes 4–8 oz. (.12–.24 Kg.), wrapped in oil paper—*Abkari opium.* Juice here being kept unshaped, ferments, yielding a hard, brittle, blackish product, showing oily spots; yield 5–7 p. c. morphine, unusually rich in narcotine, 3–4 p. c.

4. *Persian, Trebizond* (*P. somni'ferum* var. *a'lbum*).—In cylindrical sticks 7.5 Cm. (3′) long, 12 Mm. (½′) thick, wrapped in glossy paper, tied with cotton thread, ½–¾ oz. (15–23 Gm.) each, or usually in short, rounded cones 6–10 oz. (.18–.3 Kg.), or in flat circular cakes, slightly agglutinated, liver-brown color, like Egyptian, softens in moist

weather; taste very bitter, oily from linseed oil, instead of spittle used on the incising knives; yield 8–10 p. c. morphine.

5. *Chinese.*—In flat, darkish, globular cakes, in white paper, prepared, no doubt, by artificial heat, less oily than Persian, used entirely at home, and, in addition, they consume all the Indian and much Persian.

6. *French.*—Consisted of agglomerated tears, no impurities, was chiefly grown by Aubergier, during his lifetime, under the name *Affium;* no longer in commerce; yield 14–23 p. c. morphine.

Opium has been introduced into Algeria, Mozambique (African) for Chinese trade, and into New England. This latter product has been ruled out of trade, owing to its excessive adulteration, but at present we have the *Boston opium,* of high grade appearance, yet imported with admixtures, so as just to come within the U. S. P. limit. During our civil war opium was cultivated in Virginia, Tennessee, South Carolina, Georgia, being planted in September and collected in May. *Factitious opium* is a blackish aqueous extract of the plant, being nearly odorless and tasteless. London is the distributing point, as the English control its production and levy a tax upon it for the development of India, etc. Our entrepots are New York and San Francisco.

CONSTITUENTS.—Morphine (1816) 2.5–15–22.8 p. c. Narcotine (1803–1817) 1.3–10 p. c. Codeine (1832) 0.2–0.7 p. c. Narceine (1832) 0.02–0.1–0.7 p. c. Pseudo-morphine (1835) 0.2 p. c. Thebaine (1835) 0.15–1 p. c. Papaverine (1848) 1 p. c., and 12 other alkaloids all combined with either sulphuric or meconic acid, 4 p. c. Also contains glucose, mucilage, pectin, caoutchouc, wax, fat, coloring and odorous principles, lactic acid (1.25 p. c.), meconin, $C_{10}H_{10}O_4$, meconoiosin, $C_8H_{10}O_2$, ash 6 p. c.

Morphina, Morphine, $C_{17}H_{19}NO_3 + H_2O$, *official.*—Obtained by exhausting opium with water, evaporating until 1½ times the original quantity taken, placing this into an Erlenmeyer flask adding equal quantity of alcohol, twice quantity of ether, and one-third quantity of ammonia; shake, set aside over night for morphine to crystallize. Occurs in white, shining, bitter, odorless crystals soluble in alkalies, 36 parts boiling alcohol, 455 boiling water. *Tests:* 1. With nitric acid—orange-red, reddish, changing to yellow, bleached by oxidizing agents. 2. With ferric chloride T. S.—deep-blue, disappearing upon heating with acids. 3. With sulphuric acid—only faint yellow (abs. narcotine, papaverine), + potassium dichromate—only a greenish, not violet or purple (abs. strychnine). 4. Precipitate from ammonia dissolved in soda T. S. and shaken with an equal quantity of ether, should upon evaporating the ethereal layer leave no residue (abs. narcotine, codeine). Dose, gr. ⅛–¼ (.008–.016 Gm.).

Morphinæ Acetas, Morphine Acetate, *official.*—Yellowish-white, crystalline or amorphous powder, acetous odor, bitter taste, soluble in 2.5 parts water, 47 alcohol, no residue on ignition. *Tests:* With sulphuric acid get acetous vapors; with soda T. S. get white precipitate soluble in excess; should be kept dark and well stoppered. Dose, gr. ⅛–¼ (.008–.016 Gm.).

Morphinæ Hydrochloras, Morphine Hydrochlorate, *official.*—White, feathery needles, silky lustre, odorless, bitter, soluble in 24 parts water, 62 alcohol, no residue upon ignition. *Tests:* With soda T. S. get white precipitate soluble in excess; with silver nitrate T. S. get white precipitate insoluble in nitric acid. Dose, gr. $\frac{1}{8}$–$\frac{1}{4}$ (.008–.016 Gm.).

Morphinæ Sulphas, Morphine Sulphate, *official.*—White, feathery, acicular crystals, silky lustre, odorless, bitter, soluble in 21 parts water, 702 alcohol, no residue on ignition. *Tests:* With soda T. S. get white percipitate soluble in excess; with barium chloride T. S. get white precipitate insoluble in hydrochloric acid. Dose, gr. $\frac{1}{8}$–$\frac{1}{4}$ (.008–.016 Gm.).

Apomorphinæ Hydrochloras, Apomorphine Hydrochlorate, $C_{17}H_{17}NO_2HCl$, *official.*—This hydrochlorate of the artificial alkaloid is prepared by heating morphine (or codeine) 2–3 hours at 149°C. (300° F.), in a sealed glass tube with about 20 parts of pure hydrochloric acid; after cooling, dilute the liquid in the tube with water and add sodium bicarbonate to precipitate apomorphine, treat precipitate with ether or chloroform to which add a little hydrochloric acid, when crystals form. It is morphine deprived of H_2O molecule; occurs in minute grayish-white, shining, acicular crystals, odorless, bitter, greenish upon exposure, soluble in 45 parts alcohol or water, no residue upon ignition. *Tests:* With nitric acid get blood-red to orange; with sulphuric acid get violet to brown; with a mixture of these acids get dark-purple to orange; with sodium bicarbonate get white amorphous alkaloid precipitated, greenish on exposure, bluish with chloroform (dif. from morphine). If in 100 parts water have emerald-green color when shaken, it should be rejected (showing oxidation); should keep in dark-amber vials, and solutions should be freshly made with a little hydrochloric acid to prevent decomposition. Dose, gr. $\frac{1}{16}$–$\frac{1}{8}$ (.004–.008 Gm.).

Codeina, Codeine, $C_{18}H_{21}NO_3 + H_2O$, *official.*—Obtained from opium by precipitating infusion with chalk and calcium chloride, when chlorides of morphine and codeine crystallize out, dissolve these in water, add ammonia, when morphine crystallizes, evaporate filtrate for codeine; if for ammonia we use potassa or soda codeine will be precipitated and morphine remain in solution; may also obtain it artificially by heating morphine with methyl iodide and soda or potassa, hence it is methyl morphine; occurs in white octahedral crystals, odorless, bitter, soluble in 80 parts of water, 3 alcohol, no residue upon ignition; forms numerous salts (hydrochlorate, nitrate, sulphate, etc.). *Tests:* 1 Gm. + 6 Cc. sulphuric acid gives colorless solution, add 1 p. c. sodium molybdate, get green then blue and yellow; or 2 Cc. of this solution + 1 drop solution nitric acid (1 drop + 200 Cc. water) gives bluish-red to pale-blue; to 2 Cc. sulphuric acid solution warmed, add 1 drop of mixture (1 vol. ferric chloride T. S. + 19 vols. water), get blue tint (dif. from morphine); 0.05 Gm. + 2 Cc. nitric acid turns crystals red, but acid only yellow (dif. from and abs. morphine). Dose, gr. $\frac{1}{2}$–2 (.03–.13 Gm.).

Narcotine,$C_{22}H_{23}NO_7$.—Obtained from an aqueous solution by shaking, or from opium itself by macerating with ether or chloroform; occurs in tasteless, colorless, shining, rhombic crystals; soluble in ether, chloroform, benzene, hot alkaline solutions; dissolves blood-red in sulphuric acid containing some nitric acid; heated with nitric acid gives meconine, $C_{10}H_{10}O_4$, cotarnine, $C_{12}H_{13}NO_3$, and opianic acid, $C_{10}H_{10}O_5$; forms salts (hydrochlorate, sulphate, etc.). Dose, gr. 1–3 (.06–.2 Gm.).

Narceine,$C_{23}H_{29}NO_9$.—Long, silky needles, bitter, soluble in alcohol, 375 parts water, insoluble in ether; with warm diluted sulphuric acid get violet and cherry-red; with nitric acid get transiently yellow; with iodine blue; with Fröhde's reagent brown-yellow; forms salts (hydrochlorate, nitrate, sulphate, etc.). Dose, gr. ⅓–¾ (.02–.05 Gm.). The four alkaloids, morphine, codeine, narcotine and narceine can be extracted from the same opium by shaking concentrated infusion with ether—taking out narcotine; add alkali in excess to filtrate, which redissolves morphine and narceine, leaving deposited codeine, from filtrate, allow morphine to crystallize, and in mother-liquor have narceine, to be obtained by evaporation.

Meconic Acid, $C_7H_4O_7$.—Occurs free and in combination with the alkaloids; obtained by adding calcium chloride to opium infusion; this precipitate of calcium meconate is washed with hot water, alcohol, and treated with hydrochloric acid; filtrate deposits meconic acid upon cooling. *Test:* With ferric chloride T. S. get blood-red color, not discharged by dilute acids or mercuric chloride, but by stannous chloride, or alkaline hypochlorites (abs. opium alkaloids).

PREPARATIONS.—I. *Opium Pulvis.* Powdered Opium, *official;* contains 13–15 p. c. cryst. morphine. Dose, gr. 1–2 (.06–.13 Gm.). In purchasing this, should the strength be greater than 13 p. c., a proportionately less quantity can be used in preparations, thus of 17 p. c. opium only 76½ Gm. need be used wherever U. S. P. directs the 100 Gm.—17 : 13 :: 100 : x, or x = 76.47 Gm.

1. *Acetum Opii.* Vinegar of Opium. (Syn., Black Drop; Fr. Vinaigre d'Opium; Ger. Opium-Essig.)

Manufacture: 10 p. c. Macerate 10 Gm. with nutmeg 3, sugar 20, diluted acetic acid q. s. 100 Cc. Dose, ♏v–20 (.3–1.2 Cc.).

2. *Extractum Opii.* Extract of Opium. (Syn., Aqueous Extract of Opium, Extractum Thebaicum; Fr. Extrait d'Opium or Thébaïque; Ger. Opium-Extrakt.)

Manufacture: 18 p. c. morphine. Exhaust opium with water, filter, evaporate, add milk sugar q. s. Dose, gr. ¼–1 (.016–.06 Gm.).

3. *Tinctura Opii.* Tincture of Opium. (Syn., Laudanum, Tinctura Thebaica, Tinctura Meconii; Fr. Teinture (de Extrait d'Opium) Thébaïque; Ger. Tinctura Opii Simplex, Einfache Opiumtinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with precipitated calcium phosphate 5, diluted alcohol q. s. 100 Cc. Dose, ♏v–20 (.3–1.2 Cc.).

4. *Tinctura Opii Deodorati.* Tincture of Deodorized Opium. (Syn., Tinctura Opii Deodorata.)

Manufacture: 10 p. c. Exhaust 10 Gm. + precipitated calcium phosphate 5 with hot water, evaporate to 10 Cc., shake when cool with ether 20, reclaim and evaporate off latter, add water q. s. 80, finally alcohol 20 Cc. Dose, ♏v–20 (.3–1.2 Cc.).

5. *Tinctura Ipecacuanhæ et Opii.* Tincture of Ipecac and Opium. (Syn., Tincture of Dover's Powder.)

Manufacture: Evaporate tinct. opii deod. 100 Cc. to 80, add fluid extract ipecac and diluted alcohol āā 10 Cc. Dose, ♏v–20 (.3–1.2 Cc.).

6. *Tinctura Opii Camphorata.* Camphorated Tincture of Opium. (Syn., Paregoric, Paregoric Elixir; Br. Tinctura Camphoræ Composita, Compound Tincture of Camphor; Fr. Tinctura Extracti Opii Camphorata, Teinture d'Opium Camphrée, Elixir Parégorique; Ger. Tinctura Opii Benzoica, Benzoësaurehaltige Opiumtinktur.)

Manufacture: ⅖ p. c. Macerate .4 Gm. + benzoic acid .4, camphor .4, oil of anise .4 Cc., glycerin 4, diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

7. *Vinum Opii.* Wine of Opium. (Syn., Sydenham's Laudanum, Laudanum Liquidum Sydenham's; Fr. Vinum Opii Compositum, Vin d'Opium composé; Ger. Tinctura Opii Crocata, Safranhaltige Opiumtinktur.)

Manufacture: 10 p. c. Macerate 10 Gm. + cassia cinnamon 1, cloves 1, with alcohol 15 Cc., white wine 85, finishing with latter q. s. 100 Cc. Dose, ♏v–20 (.3–1.2 Cc.).

8. *Pilulæ Opii.* Pills of Opium. (Syn., Br. Pilula Saponis Composita; Fr. Pilules d'Opium; Ger. Opium-Pillen.)

Manufacture: Opium 6.5 Gm., soap 2, water q. s. 100 pills. Dose, 1–2 pills.

9. *Pulvis Ipecacuanhæ et Opii.* Powder of Ipecac and Opium. (Syn., Dover's Powder, Compound Powder of Ipecacuanhæ; Br. Pulvis Ipecacuanhæ Compositus; Fr. Poudre de Dower; Ger. Pulvis (Ipecacuanhæ Opiatus) Doweri, Dower'sches Pulver.)

Manufacture: āā 10 p. c. Opium 10 Gm., ipecac 10, milk sugar 80. Dose, gr. 5–10 (.3–.6 Gm.).

10. *Trochisci Glycyrrhizæ et Opii.* Troches of Glycyrrhiza and Opium. (Syn., Br. Trochisci Opii, Opium lozenges; Fr. Pastilles d'Opium, P. de Réglisse opiacées; Ger. Opium-pastillen.)

Manufacture: Opium .5 Gm., extract glycyrrhiza 15, acacia 12, sugar 20, oil anise .2 Cc., water q. s. 100 troches. Dose, 1–4 troches.

11. *Emplastrum Opii.* Opium Plaster. (Syn., Emp. Opiatum, Emp. Cephalicum, Emp. Odontalgicum; Fr. Emplâtre d'Opium, Emplâtre céphalique (temporal, odontalgique, calmant); Ger. Opiumpflaster, Hauptpflaster.)

Manufacture: Rub extract of opium 6 Gm. with water 8 Cc., until uniform, add this to melted Burgundy pitch 18 Gm. + lead plaster 76, evaporate moisture.

12. *Opium Deodoratum.* Deodorized Opium. (Syn., Opium Denarcotisatum; Fr. Opium Denarcotiné; Ger. Denarcotinirtes Opium.)

Manufacture: 13–15 p. c. morphine. Macerate 10 Gm. with ether

140 Cc. (in three divisions), discard ethereal solutions and mix dried residue with milk sugar q. s. 10 Gm. Dose, gr. 1–2 (.06–.13 Gm.).

II. *Morphinæ Sulphas.—official.* Dose, gr. ⅛–¼ (.008–.016 Gm.).

1. *Pulvis Morphinæ Compositus.* Compound Powder of Morphine. (Syn., Tully's Powder, Pulvis Camphoræ Compositus Tully; Fr. Poudre de Tully; Ger. Tully'sches Pulver.)

Manufacture: Morphine sulphate 1 Gm., camphor 19, glycyrrhiza 20, precipitated calcium carbonate 20, alcohol q. s. to pulverize the camphor. Dose, gr. 5–10 (.3–.6 Gm.).

2. *Trochisci Morphinæ et Ipecacuanhæ.* Troches of Morphine and Ipecac. (Syn., Fr. Pastilles de Morphine et d'Ipecacuanha; Ger. Morphinpastillen mit Brechwurzel.)

Manufacture: Morphine sulphate .16 Gm., ipecac .5, sugar 65, oil of gaultheria .2 Cc., mucilage of tragacanth q. s. 100 troches. Dose, 1–3 troches, with caution.

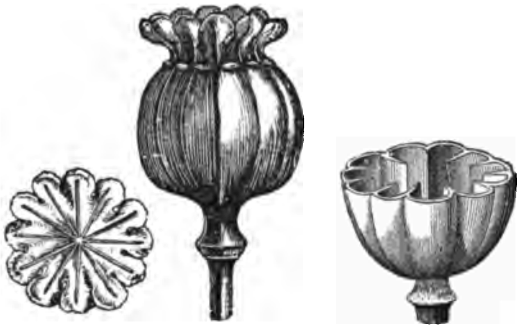
Unoff. Preps.: Liquor Morphinæ Sulphatis. Official, 1870 (¼ p. c.). Dose, ʒj–2 (4–8 Cc.). *Magendie's Solution of Morphine,* 4 p. c. If benzoic or carbolic acid (⅔ p. c.) be added to this latter solution, it will not spoil nor irritate hypodermically. Dose, ♏v–10 (.3–.6 Cc.). *Chlorodyne* (morphine hydrochlorate .5 Gm., water 2 Cc., diluted hydrochloric acid 2, chloroform 6, tincture cannabis indica 4, diluted hydrocyanic acid 1, alcohol 16, oil of peppermint 1, oleoresin of capsicum .05). Dose, ♏v–15 (.3–1 Cc.) in water, poisonous. *Oleatum Morphinæ,* 10 p. c. + oleic acid 90 p. c., use externally.

PROPERTIES.—Narcotic, sedative, anodyne, antispasmodic, hypnotic, diaphoretic, chiefly due to morphine. Narcotine is antiperiodic, tetanizing, hypnotic without being narcotic, hence name should have been anarcotine. Narceine resembles morphine, but is more hypnotic, with less after-effects—headache, constipation, etc. Codeine is hypnotic, tetanic, less constipating and active than morphine, often contaminated with other alkaloids, used for bronchial coughs and in diabetes. Thebaine or Paramorphine is soporific, spinal excitant, tetanizer, resembling strychnine in action. Papaverine is hypnotic, sedative, convulsant.

Opium in full doses, gr. 1–3 (.06–.2 Gm.), produces dry mouth, thirst, stimulates brain by increasing blood supply, arrests digestion by reducing bile, gastric and pancreatic juice secretion; causes nausea, vomiting, sweating, depressed circulation and respiration, lower temperature, contracted pupil, retention of urine, profound sopor, or, instead, coma-vigil and delirium with delightful dreams. After-effects are nausea, depression, constipation, headache, vertigo, nasal pruritus; excessive (poisonous) doses cause also slow, irregular, stertorous respiration, cold, clammy sweats, slow pulse, blue face, with pupils dilating as the end approaches; death finally by paralyzed respiration.

USES.—To relieve pain, except in acute inflammation of the brain; to cause sleep in insomnia of low fevers; to allay irritation, to check secretions—diarrhœa, dysentery, diabetes; to support system in low fevers, etc.; also for peritonitis, cerebro-spinal meningitis, cholera morbus, delirium tremens, mania spasms, melancholia, sciatica, neuralgia, cancer, renal and hepatic colic from calculi, cough without secretion; to lock bowels when required by inflammation, hemorrhages, dyspnœa, angina pectoris, cerebral anæmia; morphine hypodermically for consumption, chronic catarrh, asthma, diabetes, typhoid fever, dysenteric tenesmus, epilepsy, hysteria, croup, bronchitis, dysmenorrhœa. Externally opium applied in poultices for gout, rheumatism, ophthalmia, odontalgia, periodontitis, inflamed gums and mucous membrane of mouth. Young children are very susceptible to its narcotic effects, and to such it must be given cautiously; women are much easier affected by it than men. Some possess idiosyncrasy toward it, being on the one hand easily, on the other with difficulty, brought under its influence; others cannot tolerate the smallest dose; many animals accept it *ad libitum*—ducks, chickens, pigeons, monkeys, etc.

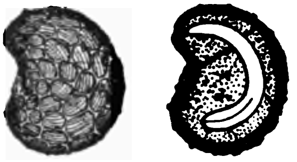
FIG. 142.



Poppy capsule showing internal septa.

Poisoning: Give tannic acid or vegetable astringents (strong coffee or tea), then evacuate the stomach (pump, apomorphine, zinc sulphate, ipecac, etc.), or wash it out with a warm solution of potassium permanganate (using twice the amount of salt as of morphine ingested), then atropine (strychnine, caffeine, cocaine, digitalis, brandy, amyl nitrite) to maintain circulation and respiration; faradization, cold douches, ambulation, flagellation; it is eliminated by the kidneys, consequently catheterize the bladder often to prevent reabsorption, and keep the patient awake.

FIG. 143.



Poppy seed magnified twelve times; *a*, the outside; *b*, longitudinal section showing embryo.

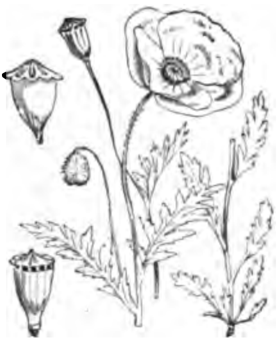
Incompatibles: Alkalies, alkaline carbonates, lime water, tannic acid and vegetable preparations containing it, salts of lead, iron, copper, mercury and zinc. Fowler's solution; atropine, strychnine, coffee, caffeine, tartar emetic, digitalis; with morphine: iodine, iodides, bromine, bromides, sodium borate.

Synergists: Alcohol, chloral hydrate, belladonna, cocaine, ipecac.

Opium-habit or disease: To this thousands of weak and strong-minded have fallen prey, including such eminent characters as Coleridge, Robert Hall, John Randolph, De Quincy, Wilkie Collins, etc. By some thought to be a habit, when it can be cured by gradually lessening the quantity or by stopping off abruptly, substituting for a time tonics and stimulants—ginger, capsicum, black pepper, quassia, calumba, diluted phosphoric acid, tincture lupulin, etc. Others consider it a disease, when it is amenable to systematic systemic treatment in hospitals, etc., where hygiene, tonics, strychnine, quinine, iron and gold salts are mainly relied upon.

Opium-test: Heat the gum, which, becoming fluid, runs when tilted from dung, mineral and vegetable matters, evaporate this heavy liquid to a powder; of this take gr. 25 (1.6 Gm.) + water ʒiv (15 Cc.), triturate, if stiff or mucilaginous—starch, flour, gum, salep; add water ℥ij (60 Cc.), filtrate should be wine-yellow—no extract liquorice; mixture should be acid—no ashes, chalk, litharge; evaporate to ℥j (30 Cc.), add potassium ferrocyanide or twice quantity alcohol, should get no precipitate—no heavy metal or gums; the insoluble residue should be gr. 10–11½ (.6–.7 Gm.), or 100 parts should yield 55–60 parts of aqueous extract.

FIG. 144.



'Papaver Rhœas.

Allied Products:

1. *Papaver, Poppy.* — The nearly ripe capsules, official, 1840–1880. These are collected in August and September, when nearly ripe, inverted to keep the juice from escaping, and dried in kilns about twelve hours. From these, deprived of seeds, can make an extract and syrup, and, including the seeds, a decoction. Capsules or heads are the size of hen's egg to one's fist and contain morphine 1–2 p. c. Syrup used for coughs; decoction for demulcent to sprains, bruises, etc.

2. *Seed.*—When black called *maw* seeds; not narcotic, yield 40–60 p. c. fixed oil, which is used as food, for burning in lamps, painters, instead of olive oil; expressed cake for cattle, seeds for birds.

3. *Exhausted gum,* for poultices as anodyne applications.

Allied Plants:

1. *P. Rhœ'as.*—Europe; flowers large, beautiful red, petals mainly used for their coloring-matter, which is yielded to water; its milky juice is sedative, demulcent, mild anodyne, probably due to *rhœadine.*

2. *Argemo'ne mexica'na, Prickly Poppy.*—Capsules and leaves contain little morphine, seeds fixed oil 36 p. c. bland, light-yellow; substitute for castor oil. Dose, ♏xv–45 (1–3 Cc.).

SANGUINARIA. SANGUINARIA (BLOOD ROOT).

Sanguinaria canadensis, *Linné.* } The rhizome collected in (summer) autumn.

Habitat. N. America—Canada, United States, in open woods on rich soil.

Syn. Indian Red Paint. Red Paint Root. Red Root, Indian Paint. Pauson. Red Puccoon. Tetter wort. Fr. Sanguinaire. Ger. Blutwurzel.

PAPAVERACEÆ.

San-gui-na′ri-a. L. *sanguinarius* fr. *sanguis*, blood; *i. e.*, all of the plant-parts abound in, and when injured emit a blood-like juice.

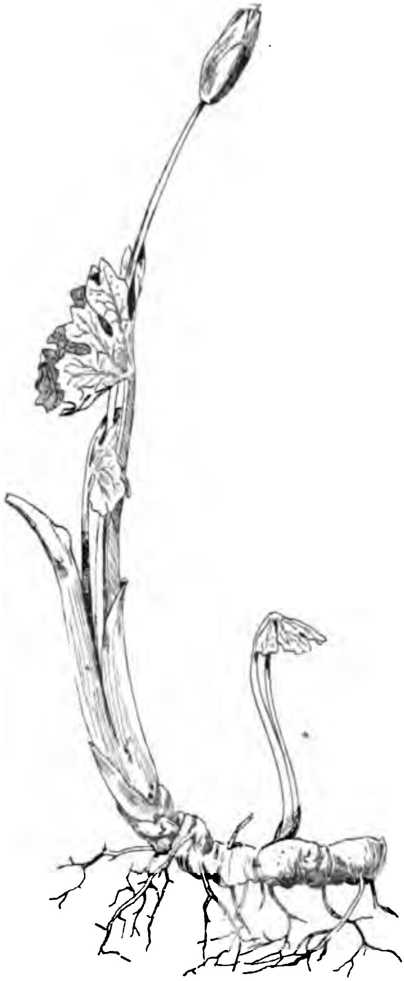
Can-a-den′sis. L. Canadian, belonging to Canada; *i. e.*, habitat, abundant there.

PLANT.—Perennial herb putting forth in spring a rounded palmate, 7–9-lobed leaf and a slender scape 10–20 Cm. (4–8′) high, bearing large, single, white flower; leaves 7.5 Cm. (3′) long, 10–12.5 Cm. (4–5′) wide, heart-shaped at base, reniform, light-green, glaucous beneath, whitish, veins 7–9, reddish; sepals 2, fugacious; petals 8–12, white; fruit June, capsule or pod, oblong, many-seeded. RHIZOME, horizontal, 5 Cm. (2′) long, 10 Mm. ($\frac{2}{5}$′) thick, cylindrical, branched, annulate, wrinkled, reddish-brown, fracture short, waxy, whitish, with many small resin-cells, or of a nearly uniform brownish-red color, bark thin, vascular-bundles small, pith large; odor slight; taste bitter, acrid. All parts contain orange-colored sap, of deepest color in the rhizome. Rapidly deteriorates with age. *Solvents:* alcohol; diluted acetic acid; water. Dose, expectorant, gr. 1–8 (.06–.5 Gm.); emetic, gr. 15–30 (1–2 Gm.).

CONSTITUENTS.—Sanguinarine 1 p. c. Chelerythrine. Protopine. Homochelidonine, $C_{22}H_{21}NO_4$, resins, starch, citric and malic acids, ash 8 p. c.

Sanguinarine, $C_{20}H_{15}NO_4$.—Chief constituent, obtained by infusing the fine root (rhizome) with hot water, diluted hydrochloric or acetic acid, precipitating with ammonia; to purify boil the precipitate with charcoal, filter, treat residue with alcohol, evaporate. It is white, soluble in alcohol, ether, benzene; yields bright-red salts (nitrate, sulphate, etc.), having acrid taste. Dose, gr. $\frac{1}{12}$–$\frac{1}{8}$;—$\frac{1}{2}$ (.005–.008;—.03 Gm.), repeated in 10 minutes for three doses.

FIG. 145.



Sanguinaria canadensis.

Chelerythrine, $C_{21}H_{17}NO_4$.—Considered almost identical with sanguinarine; obtained by passing HCl gas through ethereal tincture, drying the precipitated hydrochlorate, and dissolving it in hot water, filtering and adding ammonia; it is a reddish-yellow powder, which yields lemon-colored salts, being also found in chelidonium and opium.

Protopine, $C_{20}H_{17}NO_5$.—White crystalline powder giving with sulphuric acid deep-purple color; this is also found in chelidonium and opium. **Resins**—these yield protocatechuic acid.

PREPARATIONS.—1. *Extractum Sanguinariæ Fluidum.* Fluid Extract of Sanguinaria. (Syn., Fr. Extrait liquide de Sanguinaire; Ger. Flüssiges Blutwurzel-Extrakt.)

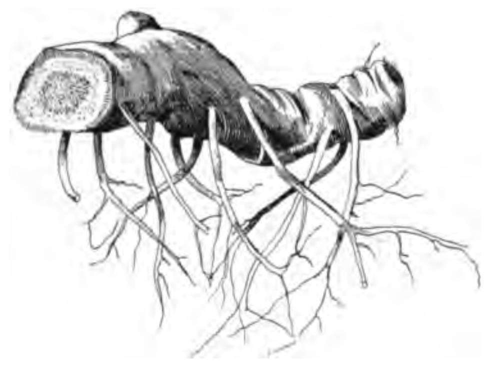
Manufacture: Moisten 100 Gm. with alcohol 75 p. c., 30 Cc. + acetic acid 5; macerate, percolate with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏j–5;—10–30 (.06–.3;—.6–2 Cc.).

2. *Tinctura Sanguinariæ.* Tincture of Sanguinaria. (Syn., Fr. Teinture de Sanguinaire; Ger. Blutwurzel-tinktur.)

Manufacture: 15 p. c. Moisten 15 Gm. with alcohol 60 p. c., 10 Cc. + acetic acid 2; macerate, percolate with alcohol 60 p. c., q. s. 100 Cc. Dose, ♏v–60;—ʒj–2 (.3–4;—4–8 Cc.).

Unoff. Preps.: Acetum, 10 p. c. Dose, ♏x–30;—ʒj–4 (.6–2;—4–15 Cc.). *Infusion,* 5 p. c. Dose, ℥ss–4 (15–120 Cc.).

FIG. 146.



Sanguinaria rhizome with transverse section.

PROPERTIES.—Systemic emetic, stimulating expectorant (increasing broncho-pulmonary mucus), tonic, alterative, sialagogue, sternutatory, emmenagogue, cardiac paralyzer, violent irritant, acro-narcotic poison. Small doses excite the stomach, increase the circulation, while large doses nauseate and depress the pulse; full doses vomit actively; excessive (poisonous) doses produce violent emesis, catharsis, burning in stomach, thirst, faintness, vertigo, dim vision, dilated pupils, lower temperature, cold sweats, slow, weak, irregular pulse, great prostration, death from paralysis of heart and respiratory centres, often preceded by convulsions; when inhaled causes violent sneezing.

USES.—Bronchitis, croup, asthma, pneumonia, chronic nasal catarrh (tincture ♏x; .6 Gm. at a dose), atonic dyspepsia with torpid liver, jaundice, duodenal catarrh, amenorrhœa, syphilis. Externally the powdered drug or juice to ulcers, warts, scaly and pustular eruptions, nasal polypi.

Poisoning: Wash out the stomach, give diffusible stimulants freely, amyl nitrite; morphine and atropine to antagonize depression of circulation and local irritation (pain and nausea).

PAPAVERACEÆ.

Incompatibles: Opium, atropine, tannic and gallic acid, alkalies, metallic salts.

Synergists: Mineral salts and emetics, vegetable emetics and alteratives.

CHELIDONIUM. CHELIDONIUM (CELANDINE).

Chelidonium majus, *Linné.* } The entire plant.

Habitat. Europe. Nat. in N. America, in waste, rocky, and cultivated grounds.

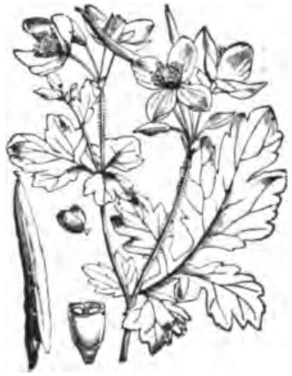
Syn. Great Celandine, Garden Celandine. Tetterwort. Fr. Chélidoine, Herb à l'Hirondelle. Ger. Schöllkraut.

Chel-i-do′ni-um. L. fr. Gr. *χελιδών*, a swallow; *i. e.*, it flowers with the coming of and dries up at the departure of the swallows.

Ma′jus. L. greater, larger; *i. e.*, to distinguish it from *Fica′ria* (*Ranu′nculus*) *Ficaria*, which is called the lesser or small *celandine*.

PLANT.—Perennial, .6 M. (2°) high, light-green; leaves pinnate, 10–20 Cm. (4–8′) long; flowers May–September, yellow, emits saffron-yellow, opaque juice if wounded; root several-headed, branching, reddish-brown; fruit capsule, linear, 2-valved; seed numerous; odor unpleasant when fresh; taste acrid. Should collect herb when beginning to flower. *Solvents:* water; alcohol. Dose, dried plant, gr. 15–60 (1–4 Gm.); fresh plant, ʒj–2 (4–8 Gm.).

FIG. 147.



Chelidonium majus, showing flowers, fruit, ovary, and seed.

CONSTITUENTS.—Chelerythrine, Chelidonine, Chelidoxanthin, Sanguinarine, protopine, chelidonic (jervic or malic) acid, chelidoninic (ethylene-succinic) acid, gum, chlorophyll.

Chelerythrine, $C_{21}H_{17}NO_4$. — Obtained from extract (alcohol 65 p. c.) by shaking with ether, which takes up this alkaloid and leaves behind chelidonine.

Chelidonine, $C_{20}H_{19}NO_5$. — Obtained as above, or by digesting the extract in diluted hydrochloric acid and precipitating with ammonia.

Chelidoxanthin.—Bitter, neutral principle, occurring in yellow needles.

Sanguinarine.—Salts are red, all the other alkaloidal salts are white.

PREPARATIONS.—(Unoff.) *Extract.* Dose, gr. 10 (.6 Gm.). *Fluid Extract.* Dose, ʒss–1 (2–4 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Expressed juice* (fresh plant). Dose, ♏x–20 (.6–1.3 Cc.).

PROPERTIES.—Cathartic, diuretic, diaphoretic, expectorant.

USES.—Jaundice, dropsy, intermittent fever, scrofula, skin diseases. The juice was used by the ancients exclusively for the same purposes as now. Externally good in warts, corns, eczema, urticaria, itching eruptions. Fresh herb used locally in amenorrhœa and as a vulnerary.

Allied Plants:

1. *Glau'cium Glaucium* (*lu'teum*), *Yellow Horned Poppy*, and *G. cornicula'tum.*—Both are similar to the official; contain yellow juice and nearly identical alkaloids, hence used for about the same purposes.

35. CRUCIFERÆ. Mustard Family.

Kru-sif'e-re. L. *Crucifer*, fem. pl. fr. *cru*(*x*)*c*, a cross, +*ferre*, to bear—flowers arranged in shape of maltese cross. Herbs or shrubs. Distinguished by pungency or acrid juice, cruciform flowers, tetradynamous stamens, and fruit a silique or silicle, 2-celled; sepals 4; petals 4; stamens 6, of which 2 are shorter and inserted lower down; pistil 1, compound, superior; seed albuminous; temperate, frigid, and tropical climates; antiscorbutic, pungent, acrid (fixed and volatile oils).

Genera: 1. **Sinapis.** 2. **Brassica.**

SINAPIS. MUSTARD.

1. SINAPIS ALBA. White Mustard.
2. SINAPIS NIGRA. Black Mustard.

1. Sinapis alba, *Linné.* } The seed.
2. Brassica nigra, (*Linné*) *Koch.* }

Habitat. Asia, S. Europe, cultivated in gardens, wild in United States.

Syn. 1. Kedlock, Yellow Mustard, Semen Erucæ. Br. Sinapis Albæ Semina. Fr. Moutarde blanche. Ger. Weisser Senf. 2. Red Mustard. Br. Sinapis Nigræ Semina. Fr. Moutarde noire (grise). Ger. Semen Sinapis, Senf Samen, Schwarzer Senf.

Si-na'pis. L. fr. G. (σί) ναπι, Celtic *nap*, a turnip.

Bras'si-ca. L. for cabbage fr. Celtic *bresic*, cabbage; *i. e.*, the fruit resemblance.

Al'ba. L. *albus*, white; *i. e.*, the seed.

Ni'gra. L. *niger*, black; *i. e.*, the seed.

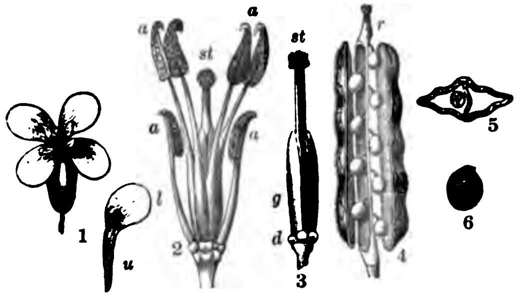
Mus'tard. L. *mustum*, must; *i. e.*, seeds were once pounded with must or vinegar.

PLANTS.—1. *Sinapis alba.*—White Mustard. Erect annual, .6 M. (2°) high, branches few, ascending, stiff, green, bristly, with reflexed hairs; leaves stalked, pinnatifid, hairy, three-lobed, dentate; flowers June, yellow, racemes; fruit silique, 2.5–4 Cm. (1–1½′) long, 5 Mm. (⅕′) wide, bristly; ribbed, beak long, sword-shaped, 4–6-seeded, dehiscing by two valves; roots fusiform, thin, branching. SEED, 2 Mm. ($\frac{1}{12}$′) thick, globular; hilum circular; testa yellowish, finely pitted, hard; embryo oily, curved radicle, two cotyledons, one folded over the other, no starch; inodorous; taste pungent, acrid.

2. *Brassica nigra.*—Black Mustard. Similar to *Sinapis alba*, only 1.3 M. (4°) high, smooth above; leaves irregularly pinnatifid, faintly toothed; flowers half as large, 6 Mm. (¼′) wide, yellow; fruit 18 Mm. (¾′) long, linear, appressed to axis of raceme, somewhat quadrangular, beak short, tapering, 3–7-seeded. SEED, 1 Mm. ($\frac{1}{25}$′) thick, testa blackish, finely pitted, hard; embryo oily, two cotyledons, no starch, inodorous when dry, but when triturated with water of a pungent, penetrating, irritating odor; taste pungent, acrid. *Solvents:* water; alcohol slightly (for both species). Dose, gr. 15–60 (1–4 Gm.).

Commercial.—White mustard is mostly a wild weed, flourishing in fields of corn under tillage; cultivated, however, in England and United States. Black mustard, though wild, is extensively cultivated natively. Both varieties of seeds yield yellow powder, of characteristic odor and taste, by grinding and sifting. When the two are powdered and mixed we then have *mustard* or *flour of mustard*, if ground with water or vinegar and spices we get semi-solid *French mustard.*

FIG. 148.

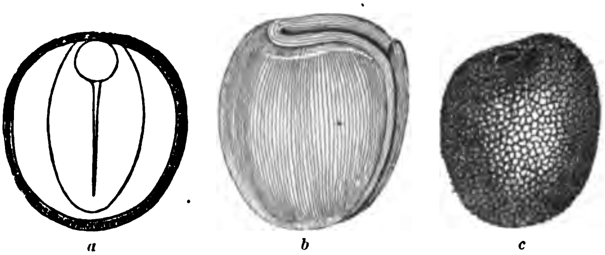


Brassica nigra; 1, flower; 2, pistil and stamens; 3, pistil; 4, silique; 5, cross-section of same; 6, seed; *a*, stamen; *st*, stigma; *g*, pistil carpels; *d*, nectar tubes; *r*, replum.

CONSTITUENTS.—1. WHITE MUSTARD: Fixed oil 22 p. c., Sinalbin, Sinapine sulphocyanide, lecithin, albumin 28 p. c., gum and mucilage 19 p. c. (mainly in testa), myrosin, other proteids, ash 4 p. c.

Fixed Oil.—Obtained by crushing seeds and expressing; it is yellowish-green, non-drying, sp. gr. .916, congeals—18° C. (0° F.), slight odor, bland, mild taste, consists of glycerides of oleic, stearic, erucic and behenic acids.

FIG. 149.



Sinapis, magnified; *a*, transverse section; *b*, embryo; *c*, entire seed.

Sinalbin, $C_{30}H_{44}N_2S_2O_{16}$.—Extracted by alcohol, is in colorless prisms, soluble in water, sparingly in alcohol, yellow by alkali, red with nitric acid; in the presence of water the ferment myrosin acts upon it, yielding sugar, sinapine sulphate, $C_{16}H_{23}NO_5.H_2SO_4$, and acrinyl sulphocyanide, $C_7H_7O.NCS$ (yellow, acrid, non-volatile oil), soluble in alcohol, ether.

Sinapine.—Alkaloid, here only as sulphocyanide, in colorless, bitter prisms; soluble in water, alcohol. Sinapine boiled with alkalies gives choline or sinkaline, $C_5H_{15}NO_2$, and sinapic acid, $C_{11}H_{12}O_5$.

2. BLACK MUSTARD: Fixed oil 23 p. c., Sinigrin (Potassium myronate) 0.5 p. c., Sinapine sulphocyanide, lecithin, albumin 30 p. c., gum and mucilage 20 p. c. (mainly in testa), myrosin, other proteids, ash 4 p. c.

Sinigrin, $KC_{10}H_{18}NS_2O_{10}$.—Silky, white needles, or golden-yellow crystals, soluble in water, slightly in alcohol, insoluble in ether, chloroform. With water and the ferment myrosin splits into sugar, acid potassium sulphate, and allyl sulphocyanide (volatile oil of mustard) 0.56 p. c.

Oleum Sinapsis Volatile. Volatile Oil of Mustard, *official*.—Obtained by macerating black mustard seed in water, then distilling. It is a yellowish, limpid liquid, strongly refractive, pungent, acrid odor and taste, sp. gr. 1.025, soluble in alcohol, ether, carbon disulphide, sulphuric acid without coloration; contains chiefly allyl sulphocyanide (isosulphocyanate), C_3H_5CNS, with traces of carbon disulphide; completely volatile at 150° C. (302° F.). *Tests:* 1. Distil oil at 148–150° C. (298–302° F.); the first and last distillate should have sp. gr. 1.025 (abs. alcohol, chloroform, carbon disulphide, petroleum or fatty oils); 2. Distil oil with alcohol 5 volumes + 1 drop ferric chloride T. S.—should not get blue or violet (abs. phenols). Dose, ♏⅛–¼ (.008–.016 Cc.).

ADULTERATIONS.—The seeds with those of some allied species; the powder with farinaceous substances, wheat flour (blue with iodine), turmeric, which renders white mustard flour even whiter (blue with iodine, reddish-brown with borax or boric acid), red pepper to increase pungency.

PREPARATIONS.—1. BLACK MUSTARD: 1. *Charta Sinapis.* Mustard Paper. (Syn., Fr. Papier Sinapisé, Moutarde en feuilles. Ger. Senf Papier.)

Manufacture: Percolate 100 Gm. with benzin until no greasy stain; dissolve India rubber 10 in benzin 100 Cc. + carbon disulphide 100, with this incorporate the purified, dried mustard, spread, dry; 60 □ Cm. contains 4 Gm. oilless mustard.

II. VOLATILE OIL: 1. *Linimentum Sinapis Compositum.* Compound Liniment of Mustard. (Syn., Fr. Liniment Sinapisé Composé; Ger. Zusammengesetztes Senfliniment.)

Manufacture: 3 p. c. Volatile oil 3 Cc., fluid extract of mezereum 20, camphor 6 Gm., castor oil 15 Cc., alcohol q. s. 100 Cc.

Unoff. Preps.: SEED: *Spirit. Infusion,* 5 p. c. Dose, *ad libitum.*

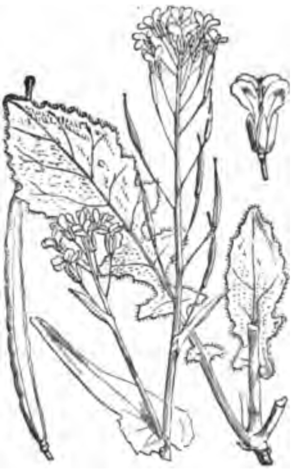
PROPERTIES.—Stimulant, emetic, tonic, diuretic, laxative, rubefacient, irritant, epispastic, carminative, condiment, vesicant; dilates the vessels, causing redness, warmth, and irritates sensory nerves, giving burning pain.

USES.—Atonic dyspepsia with constipation, delirium tremens, atonic dropsy, hiccough, narcotic poisoning. Externally: rheumatism, gout, atrophy, neuralgia, colic, gastralgia, inflammation of throat or lungs, toothache, earache, headache, vomiting, diarrhœa, dysentery, amenorrhœa, dysmenorrhœa, stimulant to heart, respiration, and vascular system.

For mild action: Dilute mustard with equal quantity of flaxseed meal or flour, and with water make it into a pasty plaster, poultice, cataplasm, or sinapism, so variously called. These should be applied enveloped in some very thin muslin to prevent sticking, and are almost superseded by the whole- and half-strength *mustard leaves*, which, in order to use, must be moistened with warm water and applied for $\frac{1}{2}$–1 hour. The volatile oil may be applied locally, well diluted (ʒss; 2 Cc. + Stokes' liniment, alcohol, or almond oil ℥ij; 60 Cc.). Good in scabies, hysteria, swooning convulsions.

Mustard foot-baths, good in headache, cerebral and other internal congestion, pneumonia, amenorrhœa, for diaphoresis.

Fig. 150.



Brassica campestris.

The infusion, made by stirring a tablespoonful to a cream with warm water is useful for emetic in poisoning, etc., giving the entire mixture.

Allied Plants:

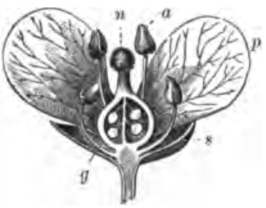
1. *Bra'ssica ju'ncea, Sarepta, Indian, Russian Mustard.*—S. Russia, Africa, India; from this latter country exported into Europe. Seeds closely resemble the official black mustard, and have the same constituents; *B. arve'nsis (Sinapi'strum), Charlock, Wild Mustard.* Europe, United States. An annual, troublesome weed; seeds smoothish, dark-brown, smaller and less pungent than our official black mustard.

2. *B. campes'tris.*—Europe, Russian Asia. Wild annual, .3–.6 M. (1–2°) high, flowers bright-yellow. Of this we have several cultivated varieties which give us edible roots and seeds of some value, thus: (*a*) var. *Na'pus, Turnip.* Seed larger than official black mustard, 1.6–2 Mm. ($\frac{1}{16}$–$\frac{1}{12}$′) thick, brown or black, finely pitted, slightly acrid. (*b*) var. *Ra'pa, Rape* or *Colza.* Seed larger than mustard or turnip, 2–2.5 Mm. ($\frac{1}{12}$–$\frac{1}{10}$′) thick, finely pitted, blue-black, slightly acrid. Both yield a bland, yellow fixed oil under the names of turnip-seed oil and rape-seed oil. (*c*) var. *Rutaba'ga, Swedish Turnip.* Seeds also small and contain oil and pungency.

3. *Rori'pa (Cochlea'ria) Armora'cia, Horse-radish.*—The fresh root official, 1820–1860; E. Europe, cultivated. Plant .6–1 M. (2–3°) high, in moist places; leaves 20–30 Cm. (8–12′) long, 10–12.5 Cm. (4–5′) wide, toothed; flowers white; fruit 2-celled pod, each 4–6-seeded; root 30 Cm. (12′) long, 12–25 Mm. ($\frac{1}{2}$–1′) thick, conical, yellowish, scaly, warty, inside white, many stone-cells, central pith, pungent odor when bruised; taste sharp, acrid, contains volatile oil

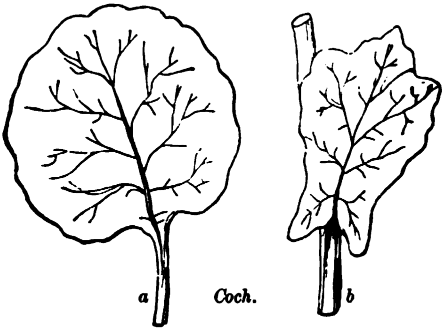
0.05 p. c. (isomeric with mustard oil, $CSNC_3H_5$), resin. Used as condiment, rubefacient, stimulant, diuretic, for dyspepsia, rheumatism, dropsy, palsy, scurvy, hoarseness, vomiting; in infusion, spirit, cataplasm. Dose, gr. 20–30 (1.3–2 Gm.).

FIG. 151.



Roripa Armoracia flower; *s*, **calyx**; *p*, **corolla**; *a*, **stamen**; *g*, **fruit-carpel**; *n*, **stigma**.

FIG. 152.



Roripa Armoracia leaves; *a*, **radical**; *b*, **cauline**.

4. *Ra'phanus Raphani'strum*, *Wild Radish*, *Jointed Charlock*, and *R. sati'vus*, *Garden Radish*.—Both contain a fixed oil resembling that from mustard, but the sulphuretted volatile oil of the latter differs in some respects.

36. HAMAMELIDACEÆ. Witch Hazel Family.

Ham-a-me-li-da'se-e. L. *Hamamel(is)-id* + aceæ, fr. Gr. ἅμα, together with, + μηλόν, fruit (apple); *i. e.*, flowers and fruit together on the tree. Shrubs, trees. Distinguished by fragrant balsamic properties; ovary inferior, 2-celled, consisting of 2 pistils united below, forming 2-beaked, 2-celled, woody capsule; ovules 1 in each cell, pendent from cell apex, becoming bony seed; stamens 8, 4 perfect, 4 scale-like, sterile; flowers, heads or spikes, sometimes apetalous; calyx and petals 4–5; temperate climates, tropics; bitter, astringent, acrid, balsamic.

Genera: 1. **Hamamelis.** 2. **Liquidambar.**

HAMAMELIS. HAMAMELIS (WITCH-HAZEL).

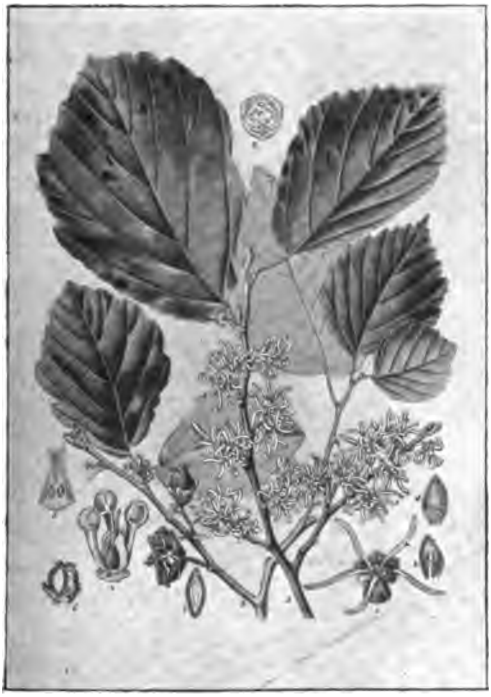
Hamamelis virginiana, *Linné.* } The leaves, collected in autumn.

Habitat. N. America, in thickets, ditch banks, Canada, United States, Minn. to La.
Syn. Winter Bloom, Striped (Spotted) Alder, Snapping Hazel Nut, Tobacco Wood. Pistachio. Fr. Hamamélis. Ger. Zauberhasel.
Ham-a-me'lis. L. see etymology, above, of Hamamelidaceæ.
Vir-gin-i-a'na. L. Virginian, of or belonging to Virginia, its original habitat.
Witch-ha'zel. *Witch*, from twigs being used in days of witchcraft as divining rods to indicate hidden springs, ores, etc., + *hazel*, resembling hazel tree.

HAMAMELIDACEÆ.

PLANT.—Woody shrub 1.5–4.5 M. (5–15°) high, 7.5–15 Cm. (3–6′) thick ; stem crooked, wood whitish ; bark brown, smooth, when old gray, fissured ; flowers Sept.–Oct., greenish-yellow ; fruit nut or capsule, 2-celled, 2-beaked with one bony, oily, edible, black seed in each cell, not ripening until September of following year, when new flowers are blooming, hence generic name, when ripe bursting elastically by hygroscopism into 2 pieces, hurling the seed with considerable force to some distance. LEAVES, 10–15 Cm. (4–6′) long, 5–7.5 Cm. (2–3′) wide, petiolate, obovate, heart-shaped, oblique at base, downy when young, wavy-toothed, thickish, nearly smooth ; inodorous ; taste astringent, bitter. *Solvents:* boiling water ; diluted alcohol. Dose, ʒss–1 (2–4 Gm.).

FIG. 153.



Hamamelis virginiana ; *A*, flowering twig ; *B*, fruit bearing twig ; 2, sepal and stamen ; 3, sepal, outer surface ; 4, essential organs ; 5, pistil ; 6, fruit ; 7, seed (last four longitudinal sections); 8, floral diagram.

CONSTITUENTS.—Tannin, volatile oil, bitter principle, extractive.

PREPARATIONS.—1. *Extractum Hamamelidis Fluidum.* Fluid Extract of Hamamelis. (Syn., Br. Extractum Hamamelidis Liquidum ; Fr. Extrait liquide de Hamamélis ; Ger. Flüssiges Hamamelis-Extrakt.)

Manufacture: Macerate, percolate 100 Gm., with glycerin 10 Cc., alcohol 50, water 80, finishing with alcohol 40 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: *Tincture.* Dose, ʒj–2 (4–8 Cc.). *Decoction.* Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 5–10 (.3–.6 Gm.). *Ointment*, externally.

PROPERTIES.—Astringent, hæmostatic, styptic, sedative, tonic. Acts on the muscular fibres of the veins; large doses produce severe throbbing headache.

USES.—It was first used by our Indians for external inflammations, congestions, and now for same purposes, as also for hemorrhages of nose, gums, piles, bladder, stomach, rectum, tumors, hemorrhoids, varicose veins, diarrhœa, dysentery.

The Pond's Extract and Distilled Extract (Aqua Hamamelidis Spirituosa) are made preferably from the fresh young twigs, collected in autumn when the plant is in bloom, by macerating for 24 hours, 100 Gm. in water 200 Cc. + alcohol 15, then distilling 100 Cc.; these are colorless and are used indiscriminately as external applications for sprains, bruises, excoriations, pharyngitis, rhinitis, leucorrhœa, gonorrhœa, ulcers, skin diseases, etc.

Allied Product:

Hamamelidis Cortex, Witch-hazel Bark.—Occurs in irregular pieces 1–2 Mm. ($\frac{1}{25}$–$\frac{1}{12}$′) thick, outside ash-gray, with blackish warts or scars, the thin corky layer easily removed from the cinnamon-colored, middle bark; this is fibrous, odorless, astringent, bitter, pungent. Contains gallic acid, hamamelo-tannic acid, $C_{14}H_{14}O_9 + 5H_2O$, glucosidal tannic acid (both derivatives of gallic acid), fat, phytosterin, glucose, resin, bitter and pungent principles, ash 6 p. c.; tonic, astringent. Dose, ʒss–1 (2–4 Gm.), in infusion or fluid extract.

STYRAX. STORAX.

Liquidambar orientalis, *Miller.* } A balsam, prepared from the inner bark.

Habitat. Asia Minor, forms entire forests.

Syn. Oriental Sweet Gum, Lordwood. Br. Styrax Præparatus, Balsamum Styracis. Fr. Styrax liquide. Ger. Flussiger Storax.

Liq-uid-am′bar. L. *liquidus*, liquid, fluid, + Ar. *ambar*, amber; *i. e.*, the color or fragrant, tenebinthinate juice or resin (balsam) resembles liquid amber.

O-ri-en-tal′is. L. oriental, pertaining to the Orient, or East; *i. e.*, its habitat.

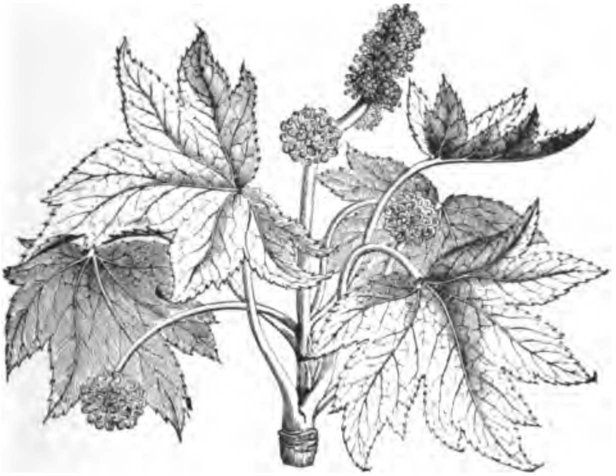
Sty′rax. L. for storax, Gr. *στύραξ*, altr. of Ar. *assthi′rak*, sweet-smelling exudation; *i. e.*, a tree producing it.

PLANT.—Tree 6–15 M. (20–50°) high, resembling our sweet-gum; bark purplish-gray; leaves palmately 5-divided, each division obscurely 3-lobed, 5–7.5 Cm. (2–3′) long, 10–12.5 Cm. (4–5′) wide, margin serrate, bright-green, smooth; flowers monœcious, in yellowish solitary heads. BALSAM (storax), semi-fluid, gray, sticky, opaque, on standing depositing heavier dark-brown stratum; transparent in thin layers; odor agreeable; taste balsamic, insoluble in water, soluble, except impurities, in equal weight of hot alcohol, which solution, upon evaporation, should yield brown, semi-liquid balsamic residue 70 p. c., almost completely soluble in ether, carbon disulphide, insoluble in benzin. Becomes more fluid by heat, then, if shaken with warm benzin, the supernatant liquid cooled, being colorless, will deposit white crystals of cinnamic acid and cinnamic ethers. *Test:* Storax dissolved in warm alcohol, this exhausted with benzin by shaking, evaporated, gives a residue (45–55 p. c.) of blue opalescence, agreeable odor, but if turpentine present get larger residue of a yellow color and terebinthinate odor. *Solvents:* alcohol; ether. Dose, gr. 10–30 (.6–2 Gm.).

ADULTERATIONS.—Turpentine, sand, ashes, bark, mineral matter 13–18 p. c., water 10–20 p. c.

Commercial.—Natives collect the resin by removing outer bark, stripping off the inner layer and throwing this into pits until quantity large, packing same into strong horse-hair bags and submitting to pressure, now throw hot water upon the bags and again express, when most of the balsam will be extracted; or may boil the bark in water and skim balsam from surface, with final expression of the boiled bark.

FIG. 154.



Liquidambar orientalis.

Liquid storax is then put into barrels, goat skins, etc., and forwarded to Constantinople, Smyrna, Syria, Alexandria, Bombay, and Trieste. The greatest demand comes from India and China, the English speaking people using but little of it. The residual bark when dried (Cortex Thymiamatis) is used for fumigation.

CONSTITUENTS.—Styrol, Styracin, Phenylpropyl Cinnamate, Storesin, Cinnamic Acid, $C_9H_8O_2$, 6–12 p. c., benzoic acid, ethyl cinnamate, $C_9H_7(C_2H_5)O_2$, ethyl vanillin, water and other impurities 25–30 p. c.

Styrol, Styrene, Styrolene (*cinnamene, phenyl-ethylene*), C_8H_8.—Hydrocarbon (volatile oil); obtained by distilling with water. It is a colorless fragrant oily liquid, sp. gr. 0.906, boils at 145° C. (293° F.) and when heated to 200° C. (392° F.) is converted into solid metacinnamene.

Styracin, Cinnamyl Cinnamate, $C_9H_7(C_9H_9)O_2$.—This is obtained in faint yellow crystals, by alcohol, ether, or hot benzene from the resin, after removal of cinnamic acid; with concentrated potassa solution yields *styrone* (cinnamic alcohol), $C_9H_{10}O$, a yellowish oily refractive aromatic liquid.

Phenylpropyl Cinnamate, $C_9H_7(C_9H_{17})O_2$.—This is a thick inodorous liquid.

Storesin, $C_{36}H_{58}O_3$.—This is the most abundant constituent of storax; it is amorphous, readily soluble in benzin, melts near 145° C. (293° F.), or near 165° C. (329° F.), the latter variety gives with potassa a compound crystallizing in needles.

PREPARATIONS.—1. *Tinctura Benzoini Composita,* 8 p. c. Dose, ℥ss–2 (2–8 Cc.)—mostly used externally.

Unoff. Prep.: *Ointment* (salve), 50 p. c., with lard or olive oil.

PROPERTIES.—Stimulant, expectorant, diuretic, antiseptic, disinfectant. Acts locally and remotely like benzoin, copaiba, balsams of Tolu and Peru. Styracin is antiseptic, and should be dissolved in 6–12 parts of oil or water to render it non-irritating as a dressing.

USES.—Chronic bronchitis and catarrhs of genito-urinary passages, gonorrhœa, gleet, amenorrhœa, leucorrhœa, phthisis, asthma. Externally in ointment as a detergent for indolent ulcers, frost-bite, as a parasiticide for scabies, phthiriasis (pediculi), etc.

Allied Products:

1. *Sty'rax Calami'ta.*—Resinous exudation from *Sty'rax officina'lis,* in agglutinated tears resembling benzoin, wrapped in leaves; a factitious variety consists of the ground, exhausted bark, or sawdust mixed with liquid storax, formed into reddish-brown cylindrical cakes, brittle, friable, soft and unctuous to the touch; contains many crystals of styracin, and has storax odor.

2. *Sweet Gum (Liquida'mbar Styraci'flua).*—United States. The balsam exudes spontaneously in hot climates and weather, or from incisions made in the trunk; it is a yellowish-brown thick liquid, solidifying on exposure, but softening by heat of the hand, odor balsamic, storax-like; taste aromatic, pungent, soluble in alcohol, ether, chloroform; contains hydrocarbon 3.5 p. c. (almost identical with styrol); cinnamic acid 5.5 p. c., styracin, storesin. Stimulant, expectorant, diuretic. Dose, gr. 5–30 (.3–2 Gm.); in emulsion; externally in ointment, cerate. Used mainly as an agreeable flavor and in making chewing gum.

3. *Heu'chera american'a, Alum Root.*—Saxifragaceæ. The rhizome official, 1820–1880; United States. Plant viscid, pubescent, .6–1.3 M. (2–4°) high; leaves 5–7.5 Cm. (2–3′) wide, crenate; flowers purplish-white; root 15 Cm. (6′) long, 12 Mm. (½′) thick, several-headed, many thin radicles, brownish-purple; bark thin, inodorous, astringent, bitter. Contains tannin 18–20 p. c., starch 5–16 p. c.; used as astringent, tonic, in diarrhœa, menorrhagia, aphthæ, ulcers, hemorrhoids. Dose, gr. 15–30 (1–2 Gm.), in decoction.

37. ROSACEÆ. Rose Family.

Ro-za'se-e. L. *Ros-a* + aceæ, fem. pl. *rosace-us*, rose-like, fr. *rosa*, a rose. Trees, shrubs or herbs. Distinguished by astringency, succulent edible fruits, prickles and warts on woody surfaces; flowers regular, 5's; stamens inserted on calyx tube, perigynous; calyx 4–5-lobed—when 5 the odd lobe posterior; anthers 2-celled; pistil 1–many, usually distinct; fruit often edible; seed exalbuminous. The yellow and white flowers resemble Ranunculaceæ, here, however, the stamens and pistils are inserted on the torus, but in Rosaceæ on the calyx; temperate climates; astringent, tonic, anthelmintic; fruit edible.

Genera: 1. **Rubus.** 2. **Rosa.** 3. **Quillaja.** 4. **Hagenia.**

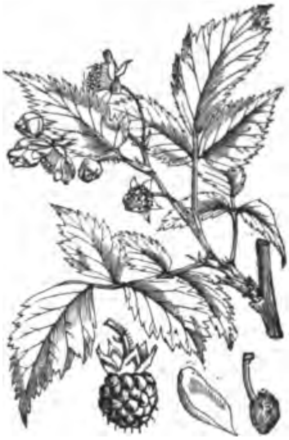
RUBUS IDÆUS. RASPBERRY.

Rubus Idæus, *Linné.* } The fruit.

Habitat. Europe, N. Asia, as far east as Japan. Cultivated.
Syn. Hindberry, Garden Raspberry. Fr. Framboise. Ger. Himbeeren.
Ru'bus. L. bramble fr. *rubere*, to be red, fr. Celtic *rub*, red; *i. e.*, color of the fruit.
I-dæ'us. L. fr. Gr. '*Ιδαιος*, pertaining to Mt. Ida, near Troy, where it once flourished.
Raspberry = rasp + berry; *i. e.*, rough condition of the plant-stem, leaves, etc.

Plant.—Shrub 2 M. (6°) high, young shoots glaucous, bristly, spinose; leaves imparipinnate, 1–3 pairs, sessile, ovate, serrate, whitish, downy leaflets; flowers white, as in following species, petals 5. Fruit, deprived of conical receptacle, therefore hollow at base, hemispherical, red, finely hairy, composed of 20–30 coalesced, small drupes, each one crowned with withered style; juice red; odor agreeable; taste pleasant, acidulous. The closely allied light-red fruit, *R. strigo'sus*, and purplish-black fruit, *R. occidenta'lis*, can be substituted for *R. Idæus*.

Fig. 155.



Rubus Idæus.

Constituents.—Volatile oil (trace), citric acid, malic acid, sugar 5 p. c., pectin, coloring matter.

Preparations.—1. *Syrupus Rubi Idæi.* Syrup of Raspberry. (Syn., Fr. Sirop de Framboise; Ger. Himbeersaft.)

Manufacture: To fresh filtered juice 40 parts, add sugar 60 parts, heat to boiling, cork tightly; avoid iron. Dose, *ad libitum.* Mostly as a flavor.

Properties.—Refrigerant, mild laxative, dietetic.

Uses.—Chiefly to furnish the syrup; highly prized as an edible fruit.

Allied Plants:

1. *R. strigo'sus* (L. *strigilis*, set with stiff, straight bristles), *Wild Red Raspberry*, *R. occidenta'lis*, *Black Raspberry*, *Thimble-berry;*

both grow wild and are largely cultivated in N. America. *R. villosus* (*R. frutico'sus*, Europe), *Blackberry*, *Dewberry*.—The fruit juice of these different species will yield, by fermentation, a grateful wine or beverage (becoming by distillation brandy), which is highly recommended, and much used by the laity, for bowel troubles.

RUBUS. RUBUS (BLACKBERRY).

Rubus { **villosus,** *Aiton,* / **canadensis,** *Linné,* / **trivialis,** *Michaux.* } The bark of the root.

Habitat. N. America, in fields, thickets, etc.

Syn. 1. American or High Bush Blackberry, Cloud or Dewberry. 2. Low Running or Creeping Blackberry, Dewberry. 3. Low Bush Blackberry. Fr. Écorce de Ronce Noir, Ronce Sauvage. Ger. Brombeerrinde.

Vil-lo′sus. L. hairy, shaggy, villous; *i. e.*, branches, petioles and underside of leaves hairy.

Can-a-den′sis. L. Canadian, of or belonging to Canada, abundant there.

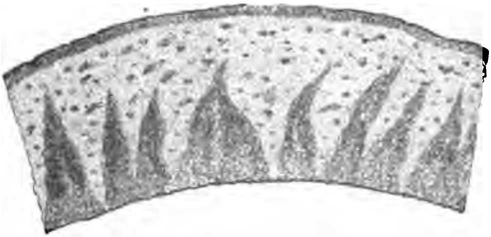
Triv-i-al′is. L. *trivium*—*tri*, three, + *via*, way, three roads; *i. e.*, grows along many roads—common, trivial.

Blackberry; i. e., color of the fruit. *Dewberry; i. e.*, glaucous bloom on the fruit.

PLANTS.—All three have stems armed with stout recurved prickles.

1. *R. villosus.*—Common or High Bush Blackberry. Pubescent perennial, viscid, prickly, .3–2 M. (1–6°) high; stem angular, woody, reddish, erect or reclining; leaflets 3–5, ovate, serrate, rough above, hairy and glandular beneath, 5–10 Cm. (2–4′) long; flowers white, racemes; fruit Aug.–Sept., of about 20 carpels; common on the borders of thickets, N. Eng. to Fla., Ark. This species furnishes our cultivated blackberries.

FIG. 156.



Rubus villosus; transverse section of bark, magnified 15 diam.

2. *R. canadensis.*—Northern Dewberry, Low Running Blackberry. Stem slender, prickly, running on ground several yards, occasionally putting forth roots; leaves with 3–5 leaflets, 2.5–4 Cm. (1–1½′) long, 12 Mm. (½′) wide, ovate, serrate, thin, nearly smooth; flowers May, large, white, racemes; fruit large, black, 12–25 Mm. (½–1′) thick, July–Aug., taste very pleasant. Common in dry, waste, stony fields, Canada to Virginia.

3. *R. trivialis.*—Southern Dewberry, Low Bush Blackberry. Procumbent shrub, bristly; leaflets 3–5, leathery, evergreen, nearly smooth; flowers large, white, earlier than preceding species, sandy soil, Maryland, southward.

BARK OF THE ROOT, in thin, tough, flexible bands, blackish-gray; inside pale-brown, sometimes with strips of whitish, tasteless wood adhering; inodorous; taste astringent, bitter. *Solvents:* boiling water; diluted alcohol. Dose, ʒss–1 (2–4 Gm.).

CONSTITUENTS.—Tannin 12–17.5 p. c. (heated gives pyrogallol, with alkalies gives neither gallic acid, protocatechuic acid nor phloroglucol), gallic acid 0.4 p. c., villosin 0.8 p. c., ash 3 p. c.

Villosin.—One of the saponins, a bitter crystalline glucoside, soluble in alcohol, slightly in water, insoluble in ether, chloroform; yields villosic acid, which is soluble in alcohol, chloroform, ether; both villosin and villosic acid give with sulphuric acid deep-blue or violet, with sulphuric and nitric acid yield blood-red disappearing by water.

PREPARATIONS.—1. *Extractum Rubi Fluidum.* Fluid Extract of Rubus. (Syn., Fluid Extract of Blackberry Bark; Fr. Extrait liquide d'Écorce de Ronce; Ger. Flüssiges Brombeerrinden-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., alcohol 60, water 30, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏x–60 (.6–4 Cc.).

Prep.: *Syrupus Rubi.* Syrup of Rubus. (Syn., Fr. Sirop d'Écorce de Ronce (Noir); Ger. Brombeerrindensirup.)

Manufacture: Fluid extract of rubus 25 Cc., syrup 75. Dose, ʒj–4 (4–15 Cc.).

Unoff. Preps.: Decoction, 5 p. c. (water or milk). Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 3–10 (.2–.6 Gm.). *Wine. Aromatic Fluid Extract. Aromatic Syrup. Brandy.*

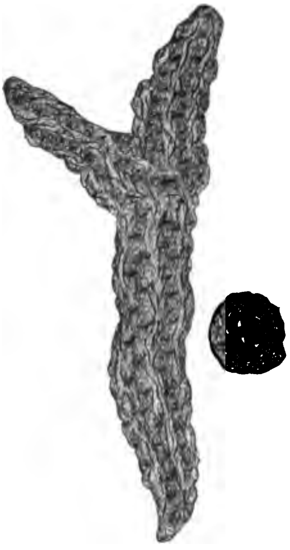
PROPERTIES.—Same as tannin; astringent, tonic.

USES.—Summer complaint, infantile diarrhœa.

Allied Plants:

1. *Ge'um riva'le, Purple* or *Water Avens.*—The rhizome official, 1820–1880. N. America. Perennial plant .3–.6 M. (1–2°) high, stem purple; leaves 3-foliate or 3-lobed; flowers purplish-orange. Rhizome 5–7.5 Cm. (2–3′) long, 6 Mm. (¼′) thick, tuberculate, wrinkled, brownish-red; bark thin, wood-wedges white, pith large; aromatic, astringent, bitter. Contains volatile oil, tannin, bitter principle. Used as astringent, tonic, in diarrhœa, hemorrhage, leucorrhœa, phthisis, scrofula, rheumatism, intermittents, dyspepsia, menstrual derangements; in decoction, infusion, tincture. Dose, gr. 15–30 (1–2 Gm.).

FIG. 157.



Potentilla Tormentilla; rhizome and transverse section.

2. *Potenti'lla Tormenti'lla, Tormentil.*—The rhizome official, 1820–1880. Europe. Plant resembles *P. canadensis, Cinquefoil*, perennial, 25–30 Cm. (10–12′) high, green or reddish leaves, trifoliate; leaflets cuneate; flowers yellow; fruit achenes, reniform. Rhizome 5 Cm. (2′) long, 12 Mm. (½′) thick, tuberculate, brownish-red; bark thin, wood-wedges small, distant; pith large, inodorous, astringent. Contains tannin 25 p. c., red coloring matter (tormentil-red), kinovic

acid, ellagic acid. Used as astringent, tonic like kino and catechu, for diarrhœa, dysentery, spongy gums (gargle), ulcers, gleet; in decoction, infusion. Dose, gr. 10–30 (.6–2 Gm.).

ROSA CENTIFOLIA. PALE ROSE.

Rosa centifolia, *Linné*. } The petals, collected after expanding.

Habitat. W. Asia, cultivated.

Syn. Cabbage Rose, Hundred leaved Rose, Flores Rosarum Incarnatarum. Fr. Roses à cent feuilles. Ger. Flores Rosæ, Rosenblätter, Hundertblätterige Rose.

Ro′sa. L. fr. Gr. *ῥόδον*, Eng. rose, fr. Celtic, *rhos*, red; *i. e.*, the prevailing color of the flowers.

Cen-ti-fo′li-a. L. *centum*, hundred, +*folium*, a leaf; *i. e.*, having a hundred leaves, petals—Pliny's name.

Plant.—Erect, 1–2 M. (3–6°) high, very similar to but larger than *Rosa gallica;* stems covered with prickles, larger ones hooked; leaves alternate, imparipinnate, 2 pairs of opposite leaflets, leaf-serratures edged with glands; flowers large, double, peduncles and calyx tube covered with setæ and glandular hairs; fruit (hip) scarlet to orange-red, oblong, containing many 1-seeded achenes; calyx persistent. Petals, numerous, roundish-obovate, retuse, or obcordate, pink, fragrant, sweetish, slightly bitter, faintly astringent. *Solvent:* boiling water. Dose, gr. 15–60 (1–4 Gm.).

Commercial.—This, although often mistaken for the Damask rose, is no doubt the most anciently cultivated variety of *R. gallica*, and exists in many hybrid forms which are indiscriminately used. The petals are collected when blooms fully mature, and in drying become brown, losing much fragrance, which latter may be greatly preserved by packing tightly in closely stoppered vessels with alternate layers of sodium chloride (half their weight).

Constituents.—Volatile oil (trace), mucilage, sugar, tannin, malates, phosphates, (quercitrin?).

Preparations.—(Unoff.) *Oil* (*Oleum*). *Water* (*Aqua*).

Properties and Uses.—Mild carminative. For distilling rose water.

ROSA GALLICA. RED ROSE.

Rosa gallica, *Linné*. } The petals, collected before expanding.

Habitat. W. Asia, S. Europe. Cultivated (England, Holland, France, United States, etc.).

Syn. French Rose, Provins Rose. Br. Rosæ Gallicæ Petala, Flores Rosarum Rubrarum. Fr. Rose de Provins, Roses rouges. Ger. Französische Rose, Essigrosen-(blätter), Zuckerrose.

Gal′li-ca. L. *gallicus*, of or pertaining to Gaul, now France; *i. e.*, country where once it flourished extensively = French rose.

Plant.—Bushy shrub, .6–1 M. (2–3°) high, stems numerous, covered with prickles and a few sharp spines; leaves alternate, imparipinnate, 2 pairs opposite leaflets, these nearly sessile, ovate, rounded

Constituents.—Tannin 12–17.5 p. c. (heated gives pyrogallol, with alkalies gives neither gallic acid, protocatechuic acid nor phloroglucol), gallic acid 0.4 p. c., villosin 0.8 p. c., ash 3 p. c.

Villosin.—One of the saponins, a bitter crystalline glucoside, soluble in alcohol, slightly in water, insoluble in ether, chloroform; yields villosic acid, which is soluble in alcohol, chloroform, ether; both villosin and villosic acid give with sulphuric acid deep-blue or violet, with sulphuric and nitric acid yield blood-red disappearing by water.

Preparations.—1. *Extractum Rubi Fluidum.* Fluid Extract of Rubus. (Syn., Fluid Extract of Blackberry Bark; Fr. Extrait liquide d'Écorce de Ronce; Ger. Flüssiges Brombeerrinden-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., alcohol 60, water 30, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏x–60 (.6–4 Cc.).

Prep.: *Syrupus Rubi.* Syrup of Rubus. (Syn., Fr. Sirop d'Écorce de Ronce (Noir); Ger. Brombeerrindensirup.)

Manufacture: Fluid extract of rubus 25 Cc., syrup 75. Dose, ʒj–4 (4–15 Cc.).

Unoff. Preps.: Decoction, 5 p. c. (water or milk). Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 3–10 (.2–.6 Gm.). *Wine. Aromatic Fluid Extract. Aromatic Syrup. Brandy.*

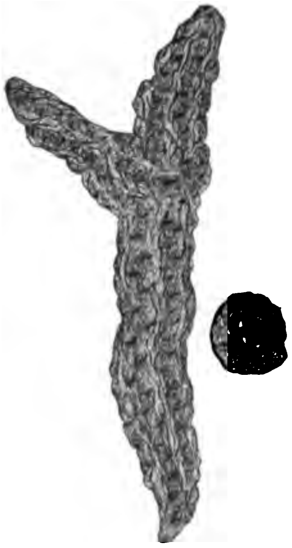
Properties.—Same as tannin; astringent, tonic.

Uses.—Summer complaint, infantile diarrhœa.

Allied Plants:

1. *Ge'um riva'le, Purple* or *Water Avens.*—The rhizome official, 1820–1880. N. America. Perennial plant .3–.6 M. (1–2°) high, stem purple; leaves 3-foliate or 3-lobed; flowers purplish-orange. Rhizome 5–7.5 Cm. (2–3′) long, 6 Mm. (¼′) thick, tuberculate, wrinkled, brownish-red; bark thin, wood-wedges white, pith large; aromatic, astringent, bitter. Contains volatile oil, tannin, bitter principle. Used as astringent, tonic, in diarrhœa, hemorrhage, leucorrhœa, phthisis, scrofula, rheumatism, intermittents, dyspepsia, menstrual derangements; in decoction, infusion, tincture. Dose, gr. 15–30 (1–2 Gm.).

Fig. 157.



Potentilla Tormentilla; rhizome and transverse section.

2. *Potenti'lla Tormenti'lla, Tormentil.*—The rhizome official, 1820–1880. Europe. Plant resembles *P. canadensis, Cinquefoil,* perennial, 25–30 Cm. (10–12′) high, green or reddish leaves, trifoliate; leaflets cuneate; flowers yellow; fruit achenes, reniform. Rhizome 5 Cm. (2′) long, 12 Mm. (½′) thick, tuberculate, brownish-red; bark thin, wood-wedges small, distant; pith large, inodorous, astringent. Contains tannin 25 p. c., red coloring matter (tormentil-red), kinovic

both grow wild and are largely cultivated in N. America. *R. villosus* (*R. frutico'sus*, Europe), *Blackberry, Dewberry.*—The fruit juice of these different species will yield, by fermentation, a grateful wine or beverage (becoming by distillation brandy), which is highly recommended, and much used by the laity, for bowel troubles.

RUBUS. RUBUS (BLACKBERRY).

Rubus { **villosus,** *Aiton,* / **canadensis,** *Linné,* / **trivialis,** *Michaux.* } The bark of the root.

Habitat. N. America, in fields, thickets, etc.

Syn. 1. American or High Bush Blackberry, Cloud or Dewberry. 2. Low Running or Creeping Blackberry, Dewberry. 3. Low Bush Blackberry. Fr. Écorce de Ronce Noir, Ronce Sauvage. Ger. Brombeerrinde.

Vil-lo'sus. L. hairy, shaggy, villous; *i. e.*, branches, petioles and underside of leaves hairy.

Can-a-den'sis. L. Canadian, of or belonging to Canada, abundant there.

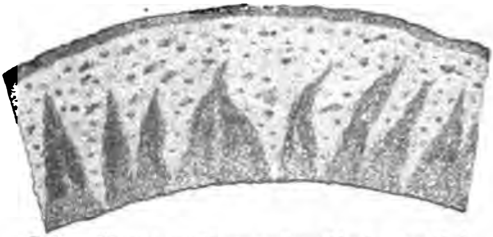
Triv-i-al'is. L. *trivium—tri*, three, + *via*, way, three roads; *i. e.*, grows along many roads—common, trivial.

Blackberry; i. e., color of the fruit. *Dewberry; i. e.*, glaucous bloom on the fruit.

PLANTS.—All three have stems armed with stout recurved prickles.

1. *R. villosus.*—Common or High Bush Blackberry. Pubescent perennial, viscid, prickly, .3–2 M. (1–6°) high; stem angular, woody, reddish, erect or reclining; leaflets 3–5, ovate, serrate, rough above, hairy and glandular beneath, 5–10 Cm. (2–4′) long; flowers white, racemes; fruit Aug.–Sept., of about 20 carpels; common on the borders of thickets, N. Eng. to Fla., Ark. This species furnishes our cultivated blackberries.

FIG. 156.



Rubus villosus; transverse section of bark, magnified 15 diam.

2. *R. canadensis.*—Northern Dewberry, Low Running Blackberry. Stem slender, prickly, running on ground several yards, occasionally putting forth roots; leaves with 3–5 leaflets, 2.5–4 Cm. (1–1½′) long, 12 Mm. (½′) wide, ovate, serrate, thin, nearly smooth; flowers May, large, white, racemes; fruit large, black, 12–25 Mm. (½–1′) thick, July–Aug., taste very pleasant. Common in dry, waste, stony fields, Canada to Virginia.

3. *R. trivialis.*—Southern Dewberry, Low Bush Blackberry. Procumb[illegible]hrub, bristly; leaflets 3–5, leathery, evergreen, nearly s[illegible]wers large, white, earlier than preceding species, sandy soil, [illegible]outhward.

[illegible]F THE ROOT, in thin, tough, flexible bands, blackish-gray; [illegible]ale-brown, sometimes with strips of whitish, tasteless wood [illegible]ing; i[illegible]ste astringent, bitter. *Solvents:* boiling water; [illegible]nted al[illegible] ʒss–1 (2–4 Gm.).

CONSTITUENTS.—Tannin 12–17.5 p. c. (heated gives pyrogallol, with alkalies gives neither gallic acid, protocatechuic acid nor phloroglucol), gallic acid 0.4 p. c., villosin 0.8 p. c., ash 3 p. c.

Villosin.—One of the saponins, a bitter crystalline glucoside, soluble in alcohol, slightly in water, insoluble in ether, chloroform ; yields villosic acid, which is soluble in alcohol, chloroform, ether; both villosin and villosic acid give with sulphuric acid deep-blue or violet, with sulphuric and nitric acid yield blood-red disappearing by water.

PREPARATIONS.—1. *Extractum Rubi Fluidum.* Fluid Extract of Rubus. (Syn., Fluid Extract of Blackberry Bark ; Fr. Extrait liquide d'Écorce de Ronce ; Ger. Flüssiges Brombeerrinden-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., alcohol 60, water 30, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏x–60 (.6–4 Cc.).

Prep.: *Syrupus Rubi.* Syrup of Rubus. (Syn., Fr. Sirop d'Écorce de Ronce (Noir) ; Ger. Brombeerrindensirup.) *Manufacture:* Fluid extract of rubus 25 Cc., syrup 75. Dose, ʒj–4 (4–15 Cc.).

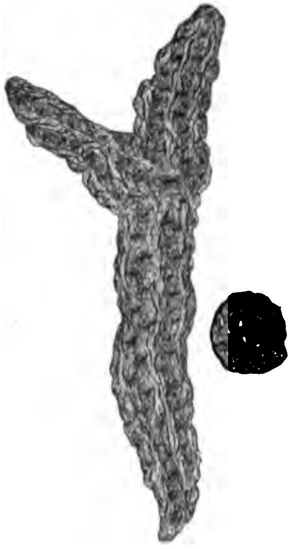
Unoff. Preps.: Decoction, 5 p. c. (water or milk). Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 3–10 (.2–.6 Gm.). *Wine. Aromatic Fluid Extract. Aromatic Syrup. Brandy.*

PROPERTIES.—Same as tannin; astringent, tonic.

USES.—Summer complaint, infantile diarrhœa.

Allied Plants:

FIG. 157.



Potentilla Tormentilla; rhizome and transverse section.

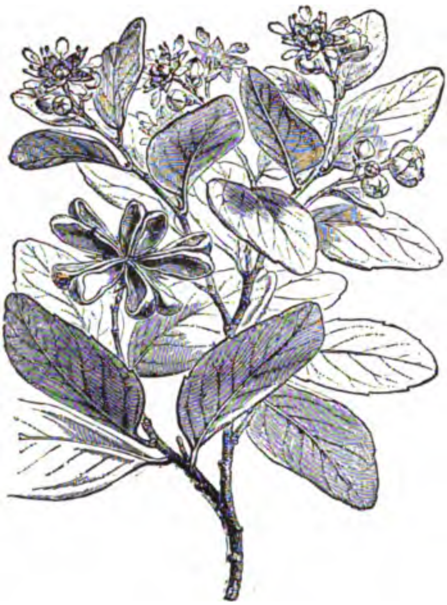
1. *Ge'um riva'le, Purple* or *Water Avens.*—The rhizome official, 1820–1880. N. America. Perennial plant .3–.6 M. (1–2°) high, stem purple ; leaves 3-foliate or 3-lobed ; flowers purplish-orange. Rhizome 5–7.5 Cm. (2–3′) long, 6 Mm. (¼′) thick, tuberculate, wrinkled, brownish-red ; bark thin, wood-wedges white, pith large ; aromatic, astringent, bitter. Contains volatile oil, tannin, bitter principle. Used as astringent, tonic, in diarrhœa, hemorrhage, leucorrhœa, phthisis, scrofula, rheumatism, intermittents, dyspepsia, menstrual derangements ; in decoction, infusion, tincture. Dose, gr. 15–30 (1–2 Gm.).

2. *Potenti'lla Tormenti'lla, Tormentil.*—The rhizome official, 1820–1880. Europe. Plant resembles *P. canadensis, Cinquefoil,* perennial, 25–30 Cm. (10–12′) high, green or reddish leaves, trifoliate; leaflets cuneate; flowers yellow; fruit achenes, reniform. Rhizome 5 Cm. (2′) long, 12 Mm. (½′) thick, tuberculate, brownish-red ; bark thin, wood-wedges small, distant ; pith large, inodorous, astringent. Contains tannin 25 p. c., red coloring matter (tormentil-red), kinovic

Quil-la′ja. L. fr. Chilian, *quillai, quillay, cullay, quillean,* to wash—good in washing; *i. e.,* from its soap-like properties.

Sap-o-na′ri-a. L. fr. *saponarius,* soapy, *sapo,* soap; *i. e.,* its mucilaginous juice forms a lather with water.

Fig. 159.



Quillaja Saponaria.

PLANT.—Medium-size tree; leaves oval, evergreen, leathery, entire or slightly dentate; flowers white, monœcious, axillary, pedunculate, apetalous, in umbels of four; fruit capsule with persistent calyx of 5 segments, many-seeded. BARK, in flat, large pieces, 5 Mm. ($\frac{1}{5}$′) thick, deprived of brown periderm, outside brownish-white, often with small patches of brown cork attached, otherwise smooth; inner surface whitish, smooth, fracture splintery, checkered with pale-brownish bast-fibres imbedded in white tissue; inodorous; taste acrid, persistent, dust sternutatory, infusion foamy like soap water; wood very hard. *Solvents:* hot water; hot alcohol; alcohol. Dose, gr. 15–30 (1–2 Gm.).

CONSTITUENTS. — Saponin, $C_{32}H_{54}O_{18}$, 9 p. c., starch, gum, calcium oxalate and sulphate.

Saponin.—A glucoside obtained by exhausting with hot alcohol, from which it separates upon cooling; by this process a small amount (with resinous and oily matter) still remains in the cold tincture, which evaporated and shaken with water emulsifies. Pure saponin is a white, amorphous pungent powder, inodorous, sweetish, causes sneezing, and consists of two glucosides: (*a*) *quillaic acid,* $C_{19}H_{30}O_{10}$, soluble in alcohol, precipitated by lead acetates. (*b*) *quillaia-sapotoxin,* $C_{17}H_{26}O_{10}$, highly poisonous, neutral, nearly insoluble in alcohol, not precipitated by normal lead acetate.

PREPARATIONS.—1. *Tinctura Quillajæ.* Tincture of Quillaja. (Syn., Teinture d'Écorce de Quillaya; Ger. Seifenrinden-tinktur.)

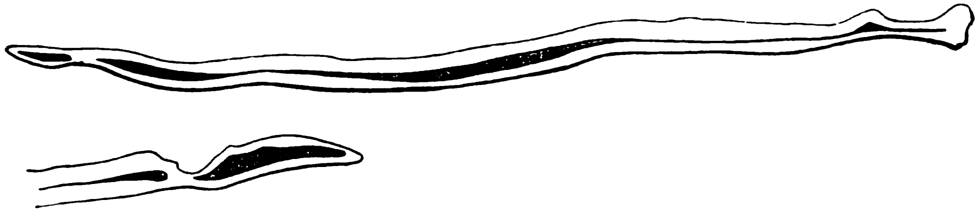
Manufacture: 20 p. c. Boil 20 Gm. with water 90 Cc. down to 60, cool, add alcohol 35, filter out precipitate, add water q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Infusion, 5 p. c. Dose, ℥ij–8 (8–30 Cc.). *Fluid Extract.* Dose, ♏v–15 (.3–1 Cc.). *Syrup,* 15 p. c. Dose, ʒj–3 (4–12 Cc.). *Aqueous Extract.* These can be taken internally, but mostly used as emulsifying agents, and in washing silks, cloth, etc., for which soap sometimes is unsuited.

PROPERTIES.—Stimulant, diuretic, expectorant, irritant, detergent. These all due to saponin, which is also found in senega and some other plants; it is a violent irritant to respiratory passages, local anæsthetic, antipyretic, paralyzant to heart and respiration, poison to voluntary muscles.

USES.—Like senega, useful in bronchitis, coryza, dropsy, rhinitis (snuff); syrup employed as a substitute for syrup of senega; dry extract (quillain) mostly in solution for emulsifying fixed oils (castor, cod-liver, etc.); the infusion for eruptions, sores, fetor of feet, armpits, etc.; to renew growth of hair in alopecia, in hair tonics, washes, etc.

FIG. 160.

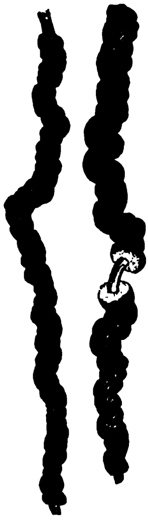


Quillaja Saponaria; cross-section of bark.

Allied Plants:

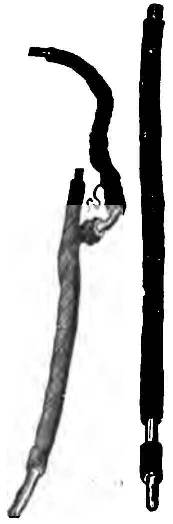
1. *Spiræ'a tomento'sa, Hardhack.*—The root official, 1820–1880.

FIG. 161.



Porteranthus stipulatus.

FIG. 162.



Porteranthus trifoliatus; rootlets, natural size.

N. America; shrub, .6–1 M. (2–3°) high, stem ferruginous, tomentous, leaves dark-green, but rusty-white beneath; flowers purple; fruit 1-seeded pod; root consists of brown, bitter, astringent bark, and hard, white, tasteless wood. Contains tannin, bitter principle, volatile oil.

Used as astringent, tonic in diarrhœa, cholera infantum, hemorrhages, gonorrhœa, ulcers, etc.; in infusion, decoction, extract. Dose, ʒss–1 (2–4 Gm.).

2. *Portera'nthus stipula'tus* (*Gille'nia stipula'cea*), *Indian Physic*, and *P. trifolia'tus* (*G. trifolia'ta*), *American Ipecac.*—The root official, 1820–1880. United States; shrubs .6–1 M. (2–3°) high, stems reddish-brown, leaves trifoliate; leaflets 5–10 Cm. (2–4′) long, pubescent; flowers white, pink; root (rhizome) 12–25 Mm. (½–1′) thick, with thin bark and many fissured rootlets, 3–6 Mm. (⅛–¼′) thick, bitter. Contains gillenin, resin, tannin. Used as emetic (substitute for ipecac), purgative, tonic; in infusion, decoction, tincture. Was very popular with our Indians. Dose, gr. 15–30 (1–2 Gm.).

CUSSO. KOUSSO (BRAYERA).

Hagenia abyssinica, (*Bruce*) *Gmelin.* } The female inflorescence.

Habitat. Abyssinia, tablelands, mountainous districts, planted near towns, villages.
Syn. Cossoo, Koosso, Kusso. Fr. Cousso, Kousso. Ger. Flores Koso, Kosenblüthen.
Ha-ge'ni-a. L. after Dr. K. G. Hagen, German botanist, died 1829.
Ab-ys-sin'i-ca. L. its habitat, Abyssinia. *Cus'so*, Abys. name of plant.

PLANT.—Handsome, ornamental tree, 6–12 M. (20–40°) high; leaves 25–30 Cm. (10–12′) long, imparipinnate; leaflets 3–6 pairs, 7.5–10 Cm. (3–4′) long, sessile, serrate; flowers Oct.–Nov., monœcious; staminate greenish-yellow, called when dry *Kousso-esels.* FEMALE (pistillate), 6 Mm. (¼′) broad, in panicles 25 Cm. (10′) long, with sheathing bract at the base of each branch; the two roundish bracts at the base of each flower, and the five obovate outer sepals are reddish color, membranous and veiny; calyx top-shaped, hairy, enclosing 2 carpels or nutlets; odor slight, fragrant, tea-like (tea, hops, and senna combined); taste bitter, acrid, nauseous, often called *Red-kousso. Solvents:* boiling water; alcohol. Dose, ʒij–6 (8–24 Gm.).

Commercial.—Cusso is gathered before the seeds are quite ripe, and suspended in the sun to dry; it is brought from Abyssinia, packed in boxes, reaching England, via Aden and Bombay. The fresher the drug and the greener the resin the more active.

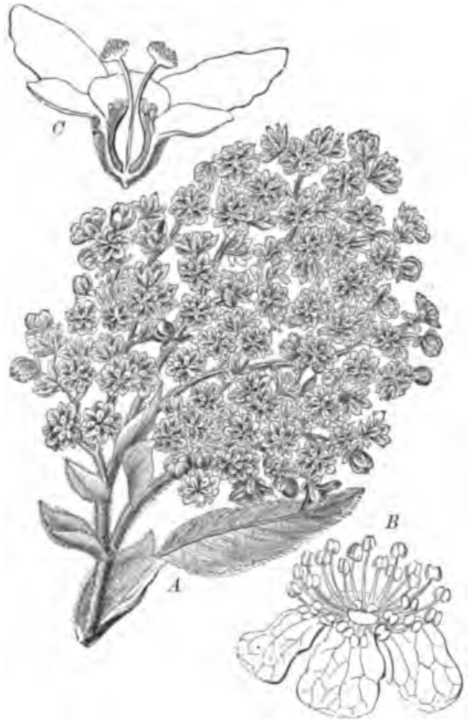
CONSTITUENTS.—Kosin, $C_{31}H_{38}O_{10}$ (resins), 6¼ p. c., Volatile oil, Tannin 24 p. c., ash 5 p. c. Latest investigations reveal: protokosin (crystalline, inactive), and kosso-toxin (amorphous, active constituent).

Kosin, Koussin, Kussin, Brayerin (*koussein*, *kussein*, amorphous).—Bitter acrid resin along with tasteless resin. Obtained by heating cusso repeatedly with alcohol to which calcium hydrate has been added, boil residue with water, mix liquids, filter, distil, treat residue with acetic acid to precipitate kosin in white, flocculent form, soon becoming denser and resin-like. It is yellow, crystalline; bitter, acrid taste; odor of Russia leather; soluble in chloroform, insoluble in water. When pure nearly inert and tasteless, hence to act properly it must be associated with the drug's other constituents. Dose, gr. 5–30 (.3–2 Gm.).

Kossotoxin, yellow, amorphous powder, soluble in alcohol, ether, insoluble in water; strong muscle poison; claimed to be the active principle, with baryta water yields a yellow, crystalline inactive substance—possibly kosin.

Volatile Oil.—Obtained by distillation; has odor of the drug; by distillation with water also get traces of valerianic and acetic acids.

FIG. 163.



Hagenia abyssinica; *A*, branch of panicle; *B*, staminate flower; and *C*, pistillate flower, magnified 4 diam.

PREPARATIONS.—1. *Extractum Cusso Fluidum.* Fluid Extract of Kousso. (Syn., Extractum Brayeræ Fluidum; Fr. Extrait liquide de Cousso; Ger. Flüssiges Koso-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ʒij–6 (8–24 Cc.).

Unoff. Preps.: Infusion. Dose, ℥iv–8 (120–240 Cc.). *Compound Emulsion* = Infusion + castor oil, ether, sugar, anise oil. *Electuary.*

PROPERTIES. — Anthelmintic, tænifuge.

USES.—From time immemorial used in Abyssinia for both kinds of worms, especially tapeworms. It is so severe as often in large doses to produce miscarriage, colic, vomiting, purging, sometimes death, but with care becomes one of the very best remedies, provided it be fresh (as the resin soon undergoes change and deterioration by age). One should fast the day previous to taking this medicine—preceding it, the night before, with a cathartic (castor oil, calomel, etc.), thus disarming, as far as possible, the parasite of its nidus. Should the drug not act within 6–8 hours, another cathartic should be administered to remove it, as well as possibly the parasite. As a rule, the worms are discharged dead within 24 hours.

The *Oleoresin of Male Fern* is more agreeable and reliable than cusso or any of its preparations, in doses of ʒss–1 (2–4 Cc.).

RECAPITULATION NO. 4.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Menispermaceæ:								
1. Menispermum. 2. Menispermum (Yellow Parilla, Canadian Moonseed).	Menispermum canadense.	The rhizome and roots.	N. America.	Berberine, menispine, tannin.	Fluid extract.	Tonic, alterative, diuretic.	Scrofulous affections.	15–60 (1–4 Gm.)
1. Pareira. 2. Pareira (Pareira Brava).	Chondrodendron tomentosum.	The root.	Brazil, Peru.	Pelosine, tannin.	Fluid extract.	Diuretic, tonic, laxative.	Cystitis, calculi, gonorrhœa, dropsy, rheumatism.	30–60 (2–4 Gm.)
1. Calumba. 2. Calumba (Columbo).	Jateorrhiza palmata (Columba).	The root.	E. Africa.	Columbin, berberine, columbic acid, starch.	Fluid extract, tincture.	Tonic, stomachic.	Dyspepsia, debility, remittent fevers, diarrhœa, phthisis.	5–30 (.3–2 Gm.)
1. Anamirta. 2. Cocculus Indicus.	Anamirta Cocculus (paniculata).	Neutral principle (from seeds).	E. India.	Picrotoxinum.	....	Nervine, sedative, antiparasitic.	Paralysis, epilepsy, chorea, spasms, colic, dysmenorrhœa.	1/64–1/32 (.001–.002 Gm.)
Lauraceæ:								
1. Sassafras. 2. Sassafras.	Sassafras Sassafras (variifolium).	The bark of the root.	N. America.	Volatile oil, sassafrid, starch, resin, tannin.	Decoc. sars. co., fld. extr. sars. co., *Oil:* syr. sars. comp.	Alterative, diaphoretic stimulant.	Skin diseases, rheumatism, syphilis.	30–60 (2–4 Gm.)
1. Sassafras Medulla. 2. Sassafras Pith.	....	The pith of the stem.	....	Mucilage.	Mucilage.	Demulcent.	Conjunctivitis, gastritis, dysentery, throat troubles.	60–240 (4–15 Gm.)
1. Cinnamomum Cassia. 2. Cassia Cinnamon. 1. Cinnamomum Saigonicum. 2. Saigon Cinnamon. 1. Cinnamomum Zeylanicum. 2. Ceylon Cinnamon.	Cinnamomum: aromaticum, zeylanicum, and other undetermined species.	The bark.	China, Anam, Java, Sumatra, S. America.	Volatile oil, tannin, sugar, mannit, starch.	Tr. card. co., tr. catechu co., tr. lav. co., vini opii, *Oil:* aqua, spirit. Ar. powd., fld. extr. ar. powd., tinct., inf. dig.	Germicide, antispasmodic, carminative, stimulant, astringent, aromatic.	Parturient, flavoring, diarrhœa, flatulence, nausea, menorrhagia.	5–30 (.3–2 Gm.)
1. Camphora. 2. Camphor.	Cinnamomum Camphora.	The stearopten.	China, Japan, Formosa.	$C_{10}H_{16}O$.	Aq., lin., cer., spt., lin. belladon., lin. sap., lin. sin. co., pulv. morph. co., tr. opii camph., monobrom. camph.	Antispasmodic, stimulant, nervine, diaphoretic, rubefacient, resolvent, antiseptic.	Hysteria, nervousness, diarrhœa, colic, rheumatism, tenesmus, asthma, cough, spasms, nausea, ulcers, scabies.	2–10 (.13–.6 Gm.)
1. Opium. 2. Opium.	Papaver somniferum.	Concrete milky exudation.	W. Asia.	Morphine, narcotine, codeine, narceine, meconic acid, etc.	Acet. extr., tr., tr. o. deod., tr. ip. et o., tr. o. camph., vin., pil., pulv. ip. et o., troch. glycyrrh. et o., emp., o. deod., pulv. morph. co., troch. morph. et ip.	Narcotic, sedative, anodyne.	Diarrhœa, peritonitis, cholera morbus, coughs, rheumatism, etc.	1–2 (.06–.13 Gm.)

1. Sanguinaria. 2. Sanguinaria (Bloodroot).	Sanguinaria canadensis.	The rhizome.	N. America.	Sanguinarine, chelerythrine, protopine, resins, citric and malic acids.	Fld. extr., tinct.	Emetic, stimulant, tonic, alterative, narcotic.	Bronchitis, croup, asthma, pneumonia, dyspepsia, jaundice, syphilis.	1–30 (.06–2 Gm.)
1. Chelidonium. 2. Chelidonium (Celandine).	Chelidonium majus.	The entire plant.	Europe.	Chelidonine, chelerythrine, chelidonic acid.	....	Cathartic, diuretic, diaphoretic, expectorant.	Jaundice, dropsy, malaria, scrofula, skin diseases.	15–60 (1–4 Gm.)
Cruciferæ:								
1. Sinapis Alba. 2. White Mustard.	Sinapis alba.	The seed.	Asia, South Europe.	Fixed oil, sinalbin, sinapine sulphocyanide, myrosin.	....	Stimulant, emetic, tonic, diuretic, laxative, rubefacient, condiment.	Dyspepsia, delirium tremens, dropsy, poisoning, rheumatism, gout, colic, headache, etc.	15–60 (1–4 Gm.)
1. Sinapis Nigra. 2. Black Mustard.	Brassica nigra.	The seed.	Asia, South Europe.	Fixed oil, sinigrin, sinapine sulphocyanide, myrosin.	Charta.			
Hamamelidaceæ:								
1. Hamamelis. 2. Hamamelis (Witch-Hazel).	Hamamelis virginiana.	The leaves.	N. America.	Tannin bitter principle, volatile oil.	Fluid extract.	Astringent, sedative, tonic.	Hemorrhages, tumors, hemorrhoids, varicose veins.	30–60 (2–4 Gm.)
1. Styrax. 2. Storax.	Liquidambar orientalis.	The balsam.	Asia Minor.	Styrol, styracin, cinnamic and benzoic acids, storesin, vanillin.	Tinct. benzoin comp.	Stimulant, expectorant, diuretic, antiseptic.	Bronchitis, catarrhs, gleet, phthisis, asthma, amenorrhœa.	10–30 (.6–2 Gm.)
Rosaceæ:								
1. Rubus Idæus. 2. Raspberry.	Rubus Idæus.	The fruit.	Europe, Asia.	Volatile oil, citric and malic acids, sugar, pectin, coloring.	Syrup.	Refrigerant, mild laxative, dietetic.	As a flavoring agent to disguise nauseous medicines.	ad lib.
1. Rubus. 2. Rubus (Blackberry).	Rubus: villosus, canadensis, trivialis.	The bark of the root.	N. America.	Tannin, gallic acid, villosin.	Fluid extract, syrup.	Astringent, tonic.	Summer complaint, infantile diarrhœa.	30–60 (2–4 Gm.)
1. Rosa Centifolia. 2. Pale Rose.	Rosa centifolia.	The petals.	W. Asia.	Volatile oil, mucilage, sugar, tannin, quercitrin.	....			15–60 (1–4 Gm.)
1. Rosa Gallica. 2. Red Rose.	Rosa gallica.	The petals.		Volatile oil, mucilage, sugar, tannin, quercitrin.	Confection, fluid extract, syrup, mel., pil. aloes and mastic.	Tonic, mild astringent, carminative.	Hemorrhages, aphthæ, ulcers, inflamed eyes, flavoring, perfumery.	15–60 (1–4 Gm.)
1. Oleum Rosæ. 2. Oil of Rose.	Rosa damascena.	The volatile oil.		Rhodinol, citronellol, stearopten.	Water, stronger water, ung. aq. rosæ.			oil externally.
1. Quillaja (Quillaia). 2. Quillaja (Soap Bark).	Quillaja Saponaria.	The inner bark.	Chili, Peru.	Saponin, starch, gum, Ca oxalate, $CaSO_4$.	Tincture.	Stimulant, diuretic, irritant, detergent.	Bronchitis, dropsy, rhinitis.	15–30 (1–2 Gm.)
1. Cusso. 2. Kousso (Brayera).	Hagenia abyssinica.	The female inflorescence.	Abyssinia.	Kosin, tannin, volatile oil.	Fluid extract.	Anthelmintic, tænifuge.	Tape-worms, lumbricoid worms.	120–360 (8–24 Gm.)

38. DRUPACEÆ. Plum Family.

Dru-pa′se-e. L. *Drup-a* + aceæ, fr. Gr. δρῦς, tree, + πέπτ-ειν, ripen, δρυπεπής, ripened on the tree; *i. e.*, the stone fruit. Trees, shrubs. Distinguished by bark and seeds containing hydrocyanic acid (poisonous), the former exuding gum, bitter; calyx 5-lobed, campanulate; petals 5, on calyx, stamens many; pistil 1, ovary 1-celled, 2-ovuled; fruit drupe; temperate climates; tonic, astringent, sedative, nutritious, lumber.

Genus: 1. **Prunus.**

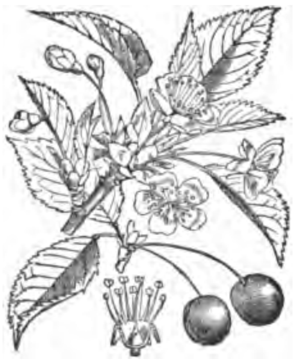
PRUNUS VIRGINIANA. WILD CHERRY.

Prunus serotina, *Ehrhart.* } The bark, collected in the autumn.

Habitat. N. America (Can. to Fla., to Minn., Neb., Kan., La., to Tex.), in woods.
Syn. Black, Choke, Cabinet, Rum or Wild Black Cherry, Black Choke, Virginian Prune Bark. Fr. Écorce de Cérisier de Virginie. Ger. Wildkirschenrinde.
Pru′nus. L. fr. Gr. πρύνη, a plum tree; *prunum*, a plum; *i. e.*, classic name.
Se-rot′i-na. L. *serotinus*, fr. *serus*, late; *i. e.*, the latest to bloom and fruit of the genus.
Vir-gin-i-a′na. L. of, or belonging to Virginia—Virginian.

Plant.—Large tree 9–24 M. (30–80°) high; trunk regular, straight, with blackish, rugged outside bark, that of young branches smooth, red or purplish; leaves 5–12.5 Cm. (2–5′) long, oval, petiolate, serrate, teeth glandular, glabrous, shining, bright-green, with two small glands on the margin at the base; flowers May–June, appearing after the leaves, small, white, racemes; fruit August, drupe, size of a pea, purplish-black, pulpy—bitter cherries; seed subglobular, bitter-almond flavor containing bland yellowish-green fixed oil 25 p. c. Bark, in curved or irregular pieces 2–3 Mm. ($\frac{1}{12}$–$\frac{1}{8}$′) thick, 2.5–5 Cm. (1–2′) long, 12–25 Mm. (½–1′) wide, brittle, outside greenish, yellowish-brown, smooth, glossy with transverse scars, consisting alone of inner layer (derm), the periderm being removed; corky layer should also be removed from old wood bark, which then has outside nut-brown, uneven, inside striate or fissured; macerated in water gives bitter-almond odor; taste astringent, aromatic, bitter; powdered bark has deep-fawn color; bark of very large and very small branches should be rejected. *Solvents:* hot or cold water. Dose, ʒss–1 (2–4 Gm.).

Fig. 164.



Prunus serotina.

Adulterations.—Unrossed bark, that of old stems, also that of choke cherry; this latter closely resembles the official, but as a rule is either thinner or thicker, and breaks with a very tough fracture like slippery elm.

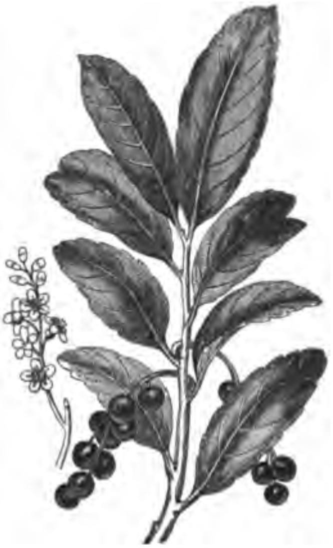
Commercial.—The Latin official name, from its long usage, has been retained, although misleading; *Prunus virginiana* was early given by Linnæus to Choke Cherry, a shrub 2.5–3 M. (8–10°) high, having more sharply toothed leaves, shorter racemes, and fruit astringents dark-red, crimson, size of wild cherry. It has received variou, names at different times, as *Prunus ru'bra, P. obova'ta, P. virginia'na, P. sero'tina, Ce'rasus sero'tina, C. virginiana.*

The true official *Prunus serotina* grows in fertile soil in fields, woods, along fences, seldom in clusters. Wood is valuable for furniture, being fine-grained, red color and easily polished. Bark after collection is (rossed) deprived of outside layer (periderm or ross) and then dried; while that from all portions of the tree is used, that from the root is strongest, yet it all soon deteriorates, consequently only the fresh-dried should be employed; the average bark collected in April yields most tannin and starch, but least hydrocyanic acid = 0.0478 p. c.; in June = 0.0956 p. c.; in Oct. = 0.1436 p. c. or $\frac{1}{7}$ gr. (.009 Gm.) from 100 gr. (6.5 Gm.) bark, which equals 7–8 ♏ (.5 Cc.) of official acid; young bark may yield of acid 0.183–0.250 p. c., old bark 0.159–0.335 p. c.

CONSTITUENTS.—Amygdalin, Emulsin, Bitter principle, tannin 2–3.5 p. c., gallic acid, resin, starch, (volatile oil, hydrocyanic acid).

Amygdalin. — Glucoside, obtained by the action of alcohol; it is bitter, non-crystalline, and not precipitated by ether, hence in this differs from that in amygdala amara.

FIG. 165.



Prunus Laurocerasus.

Emulsin.—Ferment, extracted by water; white powder when pure and by its action on amygdalin, in the presence of water, develops hydrocyanic acid and the volatile oil of bitter-almond, neither of which, as such, existed previously in the bark. These two are also obtained by distilling the seeds with water, when they come over more or less mixed. The poisonous property of the oil largely depends upon the amount of acid present, so that freed from this latter it becomes a bland, colorless liquid resembling that from bitter-almond. Some think the ferment to be neither emulsin nor synaptase, but some analogous compound.

Bitter Principle.—Obtained by mixing soft aqueous extract with alcohol, shaking with milk of lime, evaporating filtrate, boiling residue with alcohol, evaporating, getting brown, bitter, gelatinous mass, which is insoluble in ether, soluble in alcohol, brownish-red with sulphuric acid.

PREPARATIONS.—1. *Extractum Pruni Virginianæ Fluidum.* Fluid Extract of Wild Cherry. (Syn., Fr. Extrait liquide d'Écorce de Cerisier de Virginie; Ger. Flüssiges Wildkirschenrinden-Extrakt.)

Manufacture: Macerate 100 Gm. with glycerin 10 Cc., water 20, then percolate with alcohol 85 p. c., q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

2. *Infusum Pruni Virginianæ.* Infusion of Wild Cherry. (Syn., Fr. Tisane d'Écorce de Cérisier sauvage; Ger. Wildkirschen-Thee.)

Manufacture: 4 p. c. Macerate, percolate 4 Gm. with cold water q. s. 100 Cc. Dose, ℥ss–2 (15–60 Cc.).

3. *Syrupus Pruni Virginianæ.* Syrup of Wild Cherry. (Syn., Fr. Sirop d'Écorce de Cérisier; Ger. Wildkirschenrindensirup.)

Manufacture: 15 p. c. Moisten 15 Gm. with glycerin 15 Cc., water 30, percolate with water q. s. 45 Cc. in which dissolve (cold) by agitation sugar 70 Gm., finally adding water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.). Mainly for flavoring.

PROPERTIES.—Sedative, pectoral, aromatic bitter tonic, astringent; increases appetite, digestion. Volatile oil—local stimulant on alimentary canal like cascarilla, serpentaria, etc. Hydrocyanic acid—sedative, nervine, large doses reduce heart action. Tannin is astringent.

USES.—Consumption, cough, bronchitis, scrofula, heart palpitation, stomach debility, dyspepsia, hectic fever. Cold infusion in ophthalmia. It is much inferior to cinchona in intermittents.

Allied Plants:

1. *Pru'nus (Ce'rasus) Lauroce'rasus, Cherry Laurel.*—W. Asia, ornamental shrub 3–6 M. (9–20°) high; leaves 15 Cm. (6′) long, oblong, serrate, bitter-almond odor; aromatic, bitter taste. Contains laurocerasin (almost identical with amygdalin), ferment, bitter principle, tannin, sugar. Produces hydrocyanic acid and volatile oil, consisting of benzaldehyde, C_7H_6O. Sedative, narcotic. Used for making cherry-laurel water.

PRUNUM. PRUNE.

Prunus domestica, *Linné.* } The fruit.

Habitat. W. Asia, Asia Minor, Syria. Cultivated in S. France, etc.

Syn. Damson Plum, Damson, Prunes, French Plum, Saint Catherine Prunes. Fr. Pruneau Noir, Pruneaux. Ger. Pflaume(n) Zwetsche(n).

Pru'num. L. a plum, from Gr. *προῦνον, προῦνος*, plum-tree; *i. e.*, classic name.

Do-mes'ti-ca. L. *domesticus*, domestic, common; *i. e.*, the familiar or common kind.

PLANT.—Small tree 4.5–6 M. (15–20°) high; leaves 5 Cm. (2′) long, dentate, ovate, pubescent beneath; flowers April, 18 Mm. (¾′) wide, whitish; FRUIT, a drupe, 2.5–4 Cm. (1–1½′) long, oblong, shrivelled, blackish-blue, glaucous, sarcocarp brownish-yellow, sweet, acidulous, putamen hard, smooth or irregularly ridged, seed almond shape, but smaller, and of a bitter-almond taste. Dose, *ad libitum.*

Commercial.—There are several varieties of dried plums or prunes; *St. Catherine* and *Greengage* are the finer, being used as dessert fruits; those for medicine are from *P. domestica* var. *Juliana,* called in France *Prune de St. Julian.* The most and best come from Bordeaux, S. France; these ripen in the autumn and, after being pulled, are exposed, on alternate days, to the sun and stoves until dried. Germany furnishes an inferior variety which is only used in the absence of the French.

CONSTITUENTS.—SARCOCARP: Sugar 12–25 p. c., pectin, malic acid, salts. SEEDS: Fixed oil, amygdalin, emulsin.

PREPARATIONS.—1. *Confectio Sennæ,* 7 p. c. Dose, ʒj–2 (4–8 Gm.).

Unoff. Preps.: Infusion. Decoction.

PROPERTIES.—SARCOCARP: Nutritious, laxative, demulcent.

USES.—Constipation. Added to laxative confections to improve flavor and purgation; in excessive quantities they gripe, cause flatulency and indigestion due to indigestibility of the skins; they are often stewed with sugar or can be eaten alone; inferior kinds may be used in pies, tarts, etc. May ferment to make brandy which contains about 40 p. c. alcohol.

AMYGDALA AMARA. BITTER ALMOND.

Amygdalus communis var. **amara,** *Linné.* }
(Prunus Amygdalus var. **amara,** *Baillon.*) } The seed.

Habitat. W. Asia, Persia, Syria, Barbary, Morocco. (Naturalized in Mediterranean Basin.) Cultivated in Europe; unsuccessfully in the United States.

Syn. Greek Nuts. Fr. Amande Amère. Ger. Bittere Mandeln.

A-myg′da-lus. L. fr. Gr. *αμύσσω,* to lacerate; *i. e.,* its fissured shell.

Com-mu′nis. L. common, general; *i. e.,* it is the ordinary or common species.

A-ma′ra. L. *amarus,* bitter; *i. e.,* the fruit.

PLANT.—Small tree, 5–6 M. (15–20°) high, bark purplish; leaves bright-green; flowers pale-pink or white; fruit drupe, ovate, 5 Cm. (2′) long, 2.5 Cm. (1′) broad, sarcocarp green, leathery, splitting into two halves when ripe, and falling from the stone. This remaining stone is our commercial almond, and may be sold as such or may be bleached by SO_2, thereby also killing any attached insects. By cracking off hard shell the kernel, or, properly, the seed, is left, which when deprived of papery endocarp by hot water, constitutes the more desirable blanched almond. SEED (almond), 2.5 Cm. (1′) long, oblong, brownish-yellow, with about 16 lines radiating from blunt end, inside white, oily, 2 cotyledons, bitter; with water yield a milk-white emulsion having odor of hydrocyanic acid.

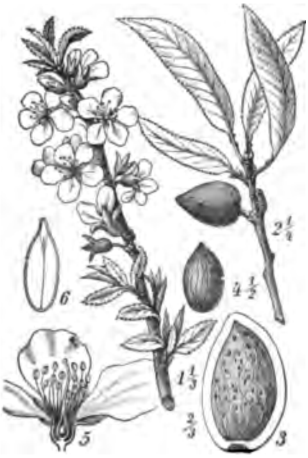
There are several varieties of these (*French, Sicily, Barbary,* in order of value), being exported chiefly from Mogador in Morocco.

CONSTITUENTS.—Fixed oil 45 p. c., Amygdalin 1–3 p. c., Emulsin, (mucilage 3 p. c., proteids (myosin, vitellin, conglutin) 25 p. c., precipitated by acetic acid, sugar 6 p. c., ash 3–5 p. c. = K, Ca, Mg—phosphates).

Amygdalin, $C_{20}H_{27}NO_{11}$.—A crystalline glucoside, obtained from expressed cake (deprived of fixed oil) by boiling in alcohol, distilling to syrup, adding water + yeast and then allowing fermentation; after this, filter, evaporate to syrup, add alcohol to precipitate amygdalin and gum, from which boiling alcohol takes up the former, depositing it upon cooling.

Emulsin (*synaptase*).—Coagulated by heat, precipitated by alcohol, but not by acetic acid, is a ferment which, in the presence of water, acts upon amygdalin, forming glucose, $C_6H_{12}O_6$, hydrocyanic acid, HCN (1 part being formed from 17 of amygdalin), and benzaldehyde, C_7H_6O = oil of bitter almond 1–4 p. c.; $C_{20}H_{27}NO_{11} + 3H_2O = 2(C_6H_{12}O_6) + HCN + C_7H_6O + H_2O$.

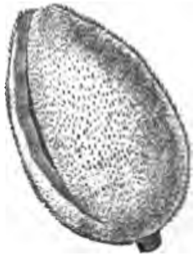
FIG. 166.



Amygdalus communis; 1, flowering twig; 2, twig with fruit; 3, fruit hull cracked off; 4, seed deprived of hull; 5, vertical section of flower; 6, longitudinal section of seed.

Oleum Amygdalæ Amaræ. Oil of Bitter Almond, *official.*—(Syn., Oleum Amygdalarum (Amararum) Æthereum; Fr. Essence d'Amandes Amères; Ger. Bittermandelöl.) Obtained by macerating bitter-almonds (expressed cake) with water and distilling. It is a clear, colorless or yellowish, volatile thin liquid, aromatic odor, bitter and burning taste, sp. gr. 1.065, soluble in alcohol, ether, consisting of benzaldehyde and hydrocyanic acid 1.5–4 p. c.; when freed from this latter being less poisonous, but even then having a marked physiological action on the nervous system; neutral but by age and exposure becoming acid from the oxidation of benzaldehyde into benzoic acid, which change is more rapid when deprived of the hydrocyanic acid. *Tests:* 1. Few drops of oil shaken with little alcohol + soda solution + ferrous sulphate T. S., then mixed with hydrochloric acid in excess gives blue precipitate (presence of hydrocyanic acid). 2. 5 Cc. oil shaken with 50 Cc. saturated solution of sodium bisulphite, heated gently, the odor of oil should disappear, solution should be clear, with no oily drops on surface of the liquid (abs. of other volatile oils and nitrobenzene). It should be kept dark, in well-stoppered bottles. Dose, ♏¼–1 (.016–.06 Cc.).

FIG. 167.



Amygdalus communis; fruit in the act of opening.

ADULTERATIONS.—The oil with alcohol, chloroform, nitrobenzene.

PREPARATIONS.—I. SEED: 1. *Syrupus Amygdalæ,* 4 p. c. Dose, ʒij–4 (8–15 Cc.).

II. OIL: 1. *Aqua Amygdalæ Amaræ.* Bitter Almond Water. (Syn., Fr. Eau d'Amandes Amères; Ger. Bittermandelwasser.)

Manufacture: $\frac{1}{10}$ p. c. Oil 1 Cc. dissolved in distilled water q. s. 100 Cc. Dose, ʒij–3 (8–12 Cc.), mostly as a flavor.

2. *Spiritus Amygdalæ Amaræ.* Spirit of Bitter Almond. (Syn., Essence of Bitter Almond; Fr. Alcoolat (Esprit) d'Amandes Amères; Ger. Bittermandelgeist.)

Manufacture: 1 p. c. Oil 1 Cc. dissolved in alcohol 80, then add distilled water q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

3. *Syrupus Amygdalæ,* 4 p. c. Dose, ʒij–4 (8–15 Cc.).

PROPERTIES.—Demulcent, nutrient, sedative; often produces urticaria.

USES.—Coughs, pulmonary troubles, flavoring.

Poisoning: Here have hydrocyanic acid symptoms, hence give emetics to vomit, galvanism, brandy, whiskey, ammonia to nostrils, etc.

Allied Products:

1. *Benzaldehyde, Benzoic Aldehyde.*—True artificial oil of bitter-almond is now largely made from toluene, C_7H_8, by heating benzal chloride, $C_6H_5CHCl_2$, under pressure, with water or sulphuric acid. Chemically and physically it is identical with the natural oil, possessing the advantages of uniformity and freedom from hydrocyanic acid.

2. *Nitrobenzene, Nitrobenzol, Oil of Mirbane.*—False artificial oil of bitter-almond, is obtained by acting on benzene with nitric acid. It is very poisonous, has the true bitter-almond oil odor, owing to which substitution has been made with fatal results.

AMYGDALA DULCIS. SWEET ALMOND.

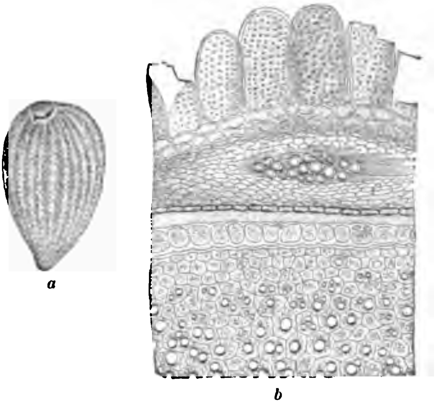
Amygdalus communis var. **dulcis,** *Linné.* } The seed.
(**Prunus Amygdalus** var. **dulcis,** *Baillon.*) }

Habitat. W. Asia, same as *amara.*
Syn. Jordan Almond. Greek Nuts. Fr. Amande douche. Ger. Süsse Mandeln.
Dul'cis. L. sweet; *i. e.*, the fruit.

PLANT.—About identical in every respect with var. *amara.* The seeds are, however, sweeter and yield an emulsion with water, having no odor of hydrocyanic acid. Dose, *ad libitum.*

Commercial. — Of these we have several varieties (*Jordan, Valencia, Sicily, Barbary,* in order of value). They are imported chiefly from Spain, S. France, via Marseilles or Bordeaux (*soft shelled;* var. *fra'gilis*), and Malaga (*Jordan* or *long*) or Valencia (*hard shelled*), and are larger and longer than the var. *amara,* with more convex sides. The Jordan, owing to their easy recognition, are alone used

FIG. 168.



Amygdalus communis; *a*, seed; *b*, section through seed-coats and portion of cotyledon.

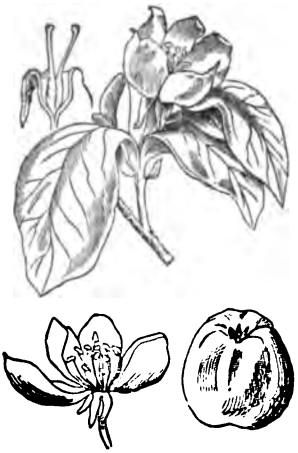
in the Br. Phar. To preserve almonds must keep dry in order to prevent decomposition of amygdalin and fixed oil. When rancid the embryo has changed into gum bassorin, which renders them unfit for medicinal use.

CONSTITUENTS.—Fixed oil 56 p. c., Emulsin, (mucilage 3 p. c., sugar 6 p. c., proteids (myosin, vitellin, and conglutin) 25 p. c., precipitated by acetic acid, ash 3–5 p. c. = K, Ca, Mg—phosphates). The *testa* of both varieties contain tannin.

Oleum Amygdalæ Expressum. Expressed Oil of Almond, *official.*—(Syn., Oleum Amygdalæ Dulcis; Br. Oleum Amygdalæ. Fr. Huile d'Amande (douce); Ger. Oleum Amygdalarum, Mandelöl.)

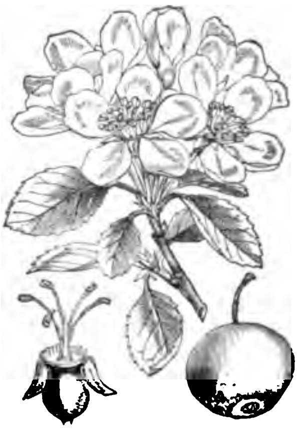
This fixed oil is obtained by expression from Sweet and Bitter Almond. It is clear, yellowish, oily liquid, nearly inodorous, taste mild nutty, sp. gr. 0.915, soluble in ether, chloroform. Contains mostly olein, with small amount of palmitin, clear at —10° C. (14° F.), congealing at — 20° C. (—4° F.). Should be kept cool, in well-stoppered bottles. *Test:* 2 Cc. shaken with 1 Cc. nitric acid + 1 Cc. water, gives whitish (not reddish or brownish) mixture, which, upon standing, separates into a solid white mass, and a scarcely colored liquid, (abs. oils of apricot, peach kernels, sesamum, cotton seed, and poppy seed.)

FIG. 169.



Cydonia (Pyrus) Cydonia.

FIG. 170.



Malus (Pyrus) Malus.

PREPARATIONS.—I. SEED: 1. *Emulsum Amygdalæ.* Emulsion of Almond. (Syn., Mistura Amygdalæ. Milk of Almond. Simple Emulsion. Fr. Lait d'Amandes; Ger. Mandelmilch.)

Manufacture: 6 p. c. Triturate blanched sweet-almond 6 Gm., acacia 1, sugar 3, with water 90 Cc., strain, add water q. s. 100 Cc. Dose, ʒij–4 (8–15 Cc.).

2. *Syrupus Amygdalæ.* Syrup of Almond. (Syn., Fr. Syrupus Emulsivus, Sirop (d'Orgeat)—d'Amande—Émulsif; Ger. Mandelsirup.)

Manufacture: 14 p. c. Triturate blanched sweet-almond 14 Gm., blanched bitter-almond 4, sugar 20, with water 40 Cc., mix these with orange-flower water 10, strain, add syrup q. s. 100 Cc. Dose, ʒij–4 (8–15 Cc.).

II. OIL: 1. *Unguentum Aquæ Rosæ*, 60 p. c. Use externally.

PROPERTIES.—Demulcent, nutrient, laxative.

USES.—The meal of the expressed cake as a toilet powder, and since it contains no starch it can readily be made into bread, cake, puddings, etc., which is most excellent for diabetes. Seed very popular as a confectionery. Expressed oil, employed like olive oil, also for pulmonary trouble.

Allied Plants:

1. *Amy'gdalus* (*Pru'nus*) *Pe'rsica, Peach.*—Persia; cultivated largely in the United States, etc. The fruit is edible, kernels poisonous, leaves mild sedative in doses of gr. 15–30 (1–2 Gm.), in infusion.

2. *Cyd'onia* (*Py'rus*) *Cydonia, Quince.*—Pomaceæ. The seed official, 1850–1890; W. Asia. Tree 2.5–6 M. (8–20°) high, with crooked, straggling branches; leaves like pear leaves; flowers white, purplish; fruit pear-shaped; seed 6 Mm. (¼′) long, ovate, triangular, brown, covered with whitish, mucilaginous epithelium, causing seeds of each cell to adhere; swell with water, forming heavy mucilage; 2 cotyledons, white, oily, bitter-almond taste; very similar to apple seeds. Contain mucilage (cydonin) 20 p. c. (not precipitated by borax or potassium silicate, soluble in cold and hot water), fixed oil, proteids; used as demulcent, protective; fruit astringent. *Mucilago Cydonii* (1 part + water 50) official, 1880–1890.

3. *Ma'lus* (*Pyrus*) *Malus, Apple.*—Plant resembles quince; fruit edible, laxative; bark tonic, febrifuge. Dose, gr. 15–60 (1–4 Gm.).

39. MIMOSACEÆ. Mimosa Family.

Mi-mo-sa'se-e. L. *Mimos-a* + aceæ, fr. L. *mimus*, Gr. *μῖμος*, a mimic; *i. e.*, the leaves often mimic, or imitate animal sensibility, moving by slight impulse, partly closing when touched, etc. Herbs, shrubs, trees. Distinguished by leaves compound, 2–3-pinnate (sometimes phyllodia); calyx 3–6-toothed or lobed, corolla 3–6's, stamens distinct or monadelphous, ovary 1-celled, ovules several; fruit, legume; tropics, temperate climates; tonic, astringent, demulcent, nutritive, dye.

Genus: 1. **Acacia.**

ACACIA. ACACIA (GUM ARABIC).

Acacia Senegal, *Willdenow,* and other species. } A gummy exudation, from stem and branches.

Habitat. E. and W. Africa, Senegal, Kordofan, Egypt, Abyssinia, India, Nubia.

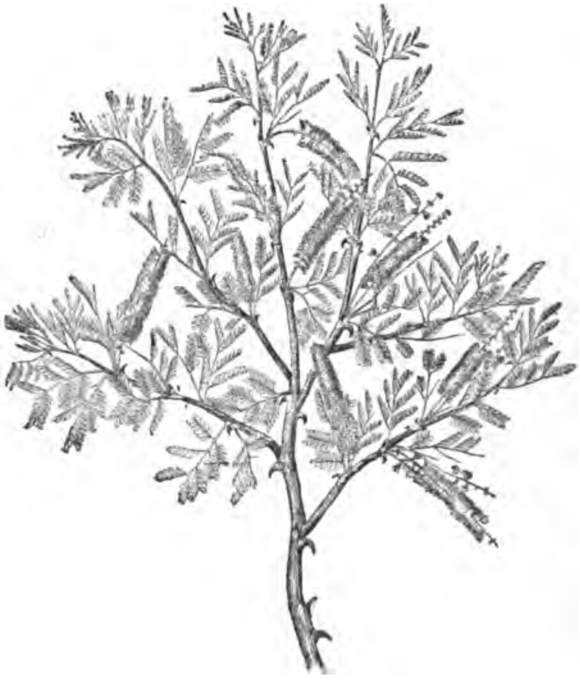
Syn. Egyptian Thorn, Indian Gum Tree, Babla(c)h Pods, Acacia bambolah. Gummi Mimosæ. Fr. Gumme Arabique. Ger. Gummi Arabicum, Arabisches Gummi.

A-ca'ci-a. L. fr. Gr. *ἀκακία*, a thorny Egyptian tree; fr. *ἀκή*, a point, tree studded with thorns.

Sen′e-gal. L. belonging to Senegal, a country and river in W. Africa; *i. e.*, the plant's original and present habitat.
Arabic—misnomer, as Arabia produces little and exports none.

PLANT.—Shrubby tree, 6 M. (20°) high, with grayish-brown bark, growing in sandy soil, deserts, forming entire forests, with little other associated vegetation, all along the Upper Nile, bears at each leaf-node 2 spines 6–12 Mm. (¼–½′) long; leaves alternate, bipinnate, paripinnate; pinnæ in two pairs; leaflets 8–10 pairs; flowers yellow; pod, loment, 7.5–10 Cm. (3–4′) long, 18 Cm. (¾′) wide, 2–6-seeded. Known by natives as *Verek* (Senegal) or *Hashabi* (E. Africa).

FIG. 171.



Acacia Senegal.

GUM (acacia), is a result of the transformation of the cell contents (cellulose) in the inner bark, where it sometimes occurs in small pouches; it forms most abundantly in hot, dry seasons, and in diseased trees. Occurs in roundish tears of various sizes, or broken angular fragments, whitish in mass, opaque from numerous fissures, fracture glass-like, sp. gr. 1.490, odorless, insipid, mucilaginous, soluble in 2 parts water; precipitated by alcohol, basic lead acetate T. S., ferric chloride T. S., sodium borate, not blue (starch) nor red (dextrin) with iodine. Dose, *ad libitum.*

ADULTERATIONS.—Inferior, dark colored, opaque, and insoluble gums, bdellium, rock salt, ligneous and earthy substances, dextrin in lumps. Powdered acacia with flour, rice-flour, starch, dextrin; all recognized by the microscope, and iodine test. The gum from quince seed, flax seed, Irish moss, etc., often used as a substitute.

Commercial.—Acacia enters market mostly from Egypt, via Alexandria, Smyrna or Trieste, in bags, boxes, casks and skins. The best gum is white and opaque, the largest producers of this being *A. Senegal* (*Ve'rek*) and *A. ara'bica* (*vera*); both grow associated with other species and contribute, along with them toward the several commercial varieties:

1. *Turkey, Egyptian Gum.*—This includes (a) Kordofan (*A. Senegal*) from west of White Nile, (b) Sennaar (*A. fi'stula, A. stenoca'rpa*) from east of White Nile (inferior, mucilage quickly sours), (c) Suakin, Talca (*A. stenocarpa, A. Se'yal*) from near Red Sea; this is very brittle, usually semi-pulverulent, is a mixture of white and brown pieces, and only dissolves with alkali.

2. *Senegal* (*A. Senegal*).—W. Africa, north of Senegal River. It is controlled by France and shipped to Bordeaux. The juice exudes through fissures caused by dry winds after the rainy season, or through made incisions. At first it is a thick liquid, which sooner or later (whereby turns the color) hardens on the bark similar to our cherry, apple or plum gums. It is mostly collected Oct.–Dec., although some in March, by the Moors and negroes who enter the Acacia forests in caravans and gather it in leather sacks, picking from the ground the fallen pieces and detaching the adherent lumps with wooden axes. This is larger than Turkey gum (some nodules being the size of a pigeon egg), less brittle, more yellow, or reddish, with fewer cracks and fracture more conchoidal. When heated with potassa does not become amber-yellow, as does the Turkey gum, and dextrin solutions.

3. *Barbary, Morocco, Mogador* (*A. nilo'tica, A. arabica*).—Collected July–August; two kinds enter Mogador, one from Morocco (resembles Turkey), the other from Timbuctoo (resembles Senegal); both in more or less brownish, roundish tears, brittle, soluble in water.

4. *India* (*A. arabica* + other species).—From Somali districts, E. Africa, and conveyed by Arab vessels to Bombay. It is much mixed, resembling somewhat Turkey and Senegal gums. Often contains Bassora gum or allied substances (insoluble, but swelling, and softening with water into a viscid mass), also resinous products resembling the turpentines. When these are culled out this variety becomes well suited for general use.

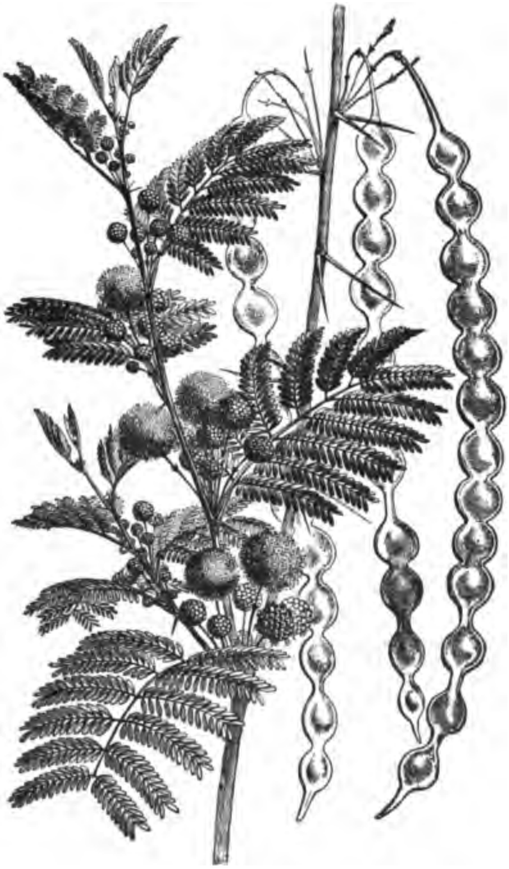
There are also gums produced from other *Acacia* species in Morocco, Cape Colony, Australia, Brazil, etc.; the *Mezquite* gum (*Proso'pis juliflo'ra*), Tex., Cal., N. Mex., Chili, resembles gum arabic, but is yellow, brown, not precipitated by lead subacetate, ferric chloride, or borax; also considerable gum from plants differing in genera and family, all of which resemble the official, except are darker.

Powdered Acacia occurs in two forms: 1. *Granulated* or *sanded*, which need lose only 2 p. c. of moisture for comminution. 2. *Finely* *dusted*, which must lose 10 p. c. of moisture in order to be reduced, thereby rendering it more lumpy and less soluble in water.

CONSTITUENTS.—Arabic acid, $C_{12}H_{22}O_{11}$, combined with Ca, Mg, K; sugar (trace), moisture 14 p. c., ash 3–4 p. c.

Arabic Acid (*gummic acid, arabin*).—A glucoside obtained by adding alcohol to acidified (HCl) mucilage. After drying it swells with water and only dissolves upon the addition of an alkali; boiled with acids yields arabinose (arabin sugar, pectinose, pectin sugar), $C_5H_{10}O_5$, in prismatic crystals, sweet, but not directly fermentable, and possibly also galactose, granular and less sweet.

FIG. 172.



Acacia arabica.

PREPARATIONS. — 1. *Mucilago Acaciæ*. Mucilage of Acacia. (Syn., Fr. Mucilage (de Gomme Arabique) Arabique; Ger. Mucilago Gummi Arabici, Gummischleim.)

Manufacture: 34 p. c. Dissolve 34 Gm. in water q. s. 100 Gm., by agitation. Spoils from formation of acetic acid, and that very quickly if hot water be employed, which can be retarded by using either alcohol 6 p. c., glycerin 10, acetanilid .4 or chloroform .5. Dose, *ad libitum*.

Preps.: 1. *Syrupus Acaciæ*. Syrup of Acacia. (Syn., Fr. Sirop de Gomme; Ger. Syrupus Gummosus, Gummisirup.)

Manufacture: Mucilage of acacia 25 Cc., syrup 75 Cc. Sometimes spoils in hot weather. Dose, *ad libitum*.

2. *Mistura Glycyrrhizæ Composita*, 10 p. c. Dose, ʒj–4 (4–15 Cc.).

2. *Pulvis Cretæ Compositus*, 20 p. c. Dose, gr. 5–60 (.3–4 Gm.).
3. *Emulsum Amygdalæ*, 1 p. c. Dose, ʒij–4 (8–15 Cc.).
4. *Pilulæ Ferri Iodidi, Pilulæ Phosphori.*

5. *Trochisci Cretæ, Troch. Cubebæ, Troch. Glycyrrhizæ et Opii.*

Properties.—Demulcent, emollient, protective, nutritive. Forms often the food of Hottentots and camels. By its viscidity sheaths inflamed surfaces; as a diluent lessens acrimony of irritating medicines.

Uses.—Coughs, laryngitis, gastritis, typhoid fever, dysentery, diarrhœa. Fine powder locally stops slight hemorrhage. Thick mucilage protects burns, ulcers, etc. In pharmacy used to suspend insoluble substances in water—emulsifying oleoresins, fixed and volatile oils, for adhering pills, troches, etc. In arts for giving lustre to fabrics, silks, thickening colors, mordants, suspending iron tannate in ink, etc. The bark of tree for dyeing, tanning, as it contains tannic and gallic acids.

Allied Plants:

1. *Acacia ara′bica* (*ve′ra*), bark reddish-brown, spines and fruit long; *A. gummi′fera, A. Ehrenbergia′na, A. Adanso′nii, A. to′rtilis, A. Fis′tula* and several others give valuable gums.

CATECHU. CATECHU.

Acacia Catechu, (*Linné filius*) *Willdenow.* } An extract prepared from the wood.

Habitat. India, Hindustan, Ceylon. (Naturalized in Jamaica in dry places.)

Syn. Terra Japonica (Japan-earth), Cutch, Gambier, Black China or Bengal Red Catechu, Catechu Nigrum. Fr. Cachu de Pégu. Ger. Katechu, Pegu-Catechu.

Cat′e-chu. L. fr. E. Indian name of extract *kutch, cutt;* Hind. *kaitha,* signifying "the juice of a tree"; applied natively to all astringent extracts.

Plant.—Crooked, branchy, shrubby tree, 4.5–12 M. (15–40°) high, 15–45 Cm. (6–18′) thick, bark brown; wood whitish and reddish; leaves alternate, paripinnate, bipinnate, 12.5–20 Cm. (5–8′) long, pinnæ in 10–20 pairs, 2.5–5 Cm. (1–2′) long with a pair of hooked, brown prickles at each base; leaflets opposite, 20–30 pairs in each pinna, 6 Mm. (¼′) long; flowers, May–June, yellow, spikes; pod, loment, brown, flat, 5–12.5 Cm. (2–5′) long, 18 Mm. (¾′) wide; seed 3–10, brown, shining, flattened, coriaceous, veined. Extract (catechu), in irregular masses, dark-brown, brittle, porous, fracture conchoidal, little glossy, containing fragments of leaves; inodorous; taste sweetish, astringent. Alcohol dissolves 85 p. c., ether 50 p. c., ferric chloride T. S. turns the diluted alcoholic solution green. *Solvents:* water; alcohol; diluted alcohol. Dose, gr. 5–30 (.3–2 Gm.).

Adulterations.—Fragments of leaves, mats or cloth, sticks, sand, ferrous carbonate, sometimes to 65 p. c. Artificial catechu is made by evaporating decoction of roasted powdered mahogany, walnut, and other colored woods, and is also used in dyeing.

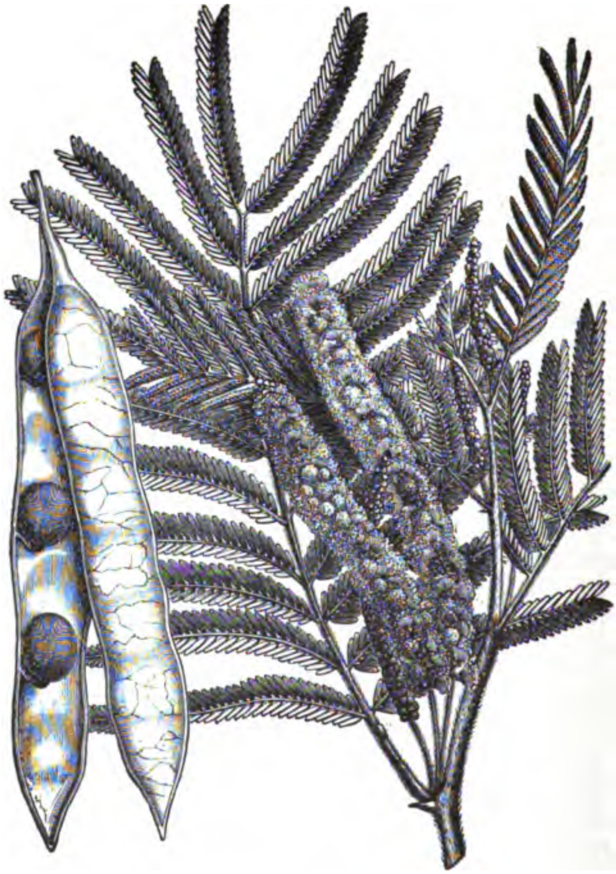
Commercial.—The extract is prepared by removing sapwood and bark and making a decoction, in earthen pots, of the heart-wood in fine chips; strain, evaporate to proper consistence, and pour into clay moulds or on leaves, mats, cloths, etc., previously dusted with cow-dung ashes. In the plastic state it is divided into squares by strings, and then dried in the sun. Sometimes all woody portions are used in making the decoction; the pinkish-brown catechu is prepared at

Kumaon, N. India, by stopping evaporation short of ropiness and allowing liquid to cool on twigs. It is chiefly exported from Pegu and Calcutta, packed in mats, chests, or boxes. We have several commercial varieties:

1. *Plano-convex* (*Cake*).—In circular cakes, one side flat, the other convex, 5–15 Cm. (2–6′) in diameter, weighing ¼–2 lbs. (.12–1 Kg.).

2. *Pegu.*—Characterized by compactness, shining fracture, port-wine color, resembling kino; in large masses, 50–100 lbs. (23–46 Kg.).

Fig. 173.



Acacia Catechu.

3. *Quadrangular* (*Cake*), *Bengal.*—Rarely found in market, 5–7.5 Cm. (2–3′) in length, breadth and thickness, dark-brown, fracture dull or shining

4. *Ball, Bombay.*—Size of orange, round or bilaterally compressed, like opium, hard, heavy, externally ferruginous, interior having much sand.

CONSTITUENTS.—Catechu-tannic acid 35 p. c., Catechin, Catechu-red, quercetin, gum, ash 0.6–6 p. c.

Catechu-tannic Acid.—Obtained by treating catechu with cold water (this brown solution gives gray precipitate with gelatin, olive-brown with ferric salts) and evaporating the solution ; it is in reddish-brown scales or powder, soluble in alcohol, insoluble in ether.

Catechin, Catechuin (*catechinic* or *catechuic acid*), $C_{18}H_{18}O_8$.—Obtained by boiling catechu in water, straining, allowing to settle for several days ; this crude catechin is pressed dry, then dissolved in diluted alcohol, the filtered solution shaken with ether, the ethereal solution evaporated, and water added from which in several days it crystallizes out in whitish needles. It is sweetish, soluble in ether, green with ferric salts, precipitated by albumin, not by gelatin. On dry distillation yields pyrocatechin, phenol and acetic acid ; when fused with potassa gives phloroglucin and proto-catechuic acid, $C_7H_6O_4$. Pyrocatechin (pyrocatechuic acid, catechol), $C_6H_6O_2$, occurs in colorless prisms, soluble in water, alcohol, ether ; with ferric chloride gives dark-green, by ammonia changing to violet. The mother-liquor from catechin yields quercetin.

Catechu-red, $C_{38}H_{34}O_{15}$.—This is contained in the deep-red liquid left behind, after the catechin has been dissolved out by ether.

PREPARATIONS.—1. *Tinctura Catechu Composita.* Compound Tincture of Catechu. (Syn., Br. Tinctura Catechu ; Fr. Teinture de Cachou ; Ger. Katechutinktur.)

Manufacture: 10 p. c. Percolate 10 Gm. + cassia cinnamon 5, with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

2. *Trochisci Catechu.* Troches of Catechu. (Syn., Catechu Lozenges ; Fr. Tablettes (Pastilles) de Cachou ; Ger. Katechupastillen.)

Manufacture: Catechu 6 Gm., sugar 65, tragacanth 2, stronger orange flower water q. s. 100 troches. Dose, 1 troche occasionally.

Unoff. Preps.: Infusion. Fluid Extract. Pulv. Catechu Comp.

PROPERTIES.—Similar to tannic acid, astringent, tonic. The dark is most powerful, acting more energetically and harshly than kino.

USES.—Diarrhœa, leucorrhœa, gonorrhœa, cough, chronic sore throat, phthisis, bronchitis, hemorrhage, relaxed uvula, ulcerated nipples, chronic ulcers, relaxed oral mucous membrane and spongy gums (mouth-wash). In the arts, for tanning, dyeing.

Allied Plants:

1. *A. Su'ma.*—Differs from *A. Catechu* only in its white bark, more leaflets, shorter corolla, and stronger spines. S. India, E. Africa (forests), S. America. Once furnished most of the commercial catechu, and still some ; the bark is used in tanning. *A. ara'bica, Babul Bark.* India. Furnishes good extract ; the fruit contains tannin 22 p. c.

2. *Ouroupa'ria* (*Unca'ria*) *Ga'mbir, Catechu, Gambir, Terra Japonica, Pale Catechu.*—Made from leaves, shoots, etc.; occurs in 2.5 Cm. (1′) cubes, yellowish-brown, sweetish, floats on water ; it is chewed by Malays along with Penang and Areca nut, and is official in Br. and G. Phar.

3. *Are'ca Ca'techu*, *Areca* or *Betel nut.*—Palmaceæ (see page 88). Palm tree cultivated in India. Extract made by evaporating decoction of the powdered nuts.

40. CÆSALPINACEÆ. Senna Family.

Ses-al-pi-na'se-e. L. *Cæsalpin-us* + aceæ, after Andreas Cæsalpinús (1519–1603), a noted Italian botanist and physician. Trees, herbs, shrubs. Distinguished by leaves compound, bipinnate, stipulate, stems often prickly; flowers yellow or red, calyx 5's, petals 5, upper one enclosed by lateral ones in bud; fruit legume, dehiscent; tropics; astringent, cathartic, tonic, diuretic, dye.

Genera: **1. Cassia (Cathartocarpus). 2. Tamarindus. 3. Hæmatoxylon. 4. Copaiva.**

CASSIA FISTULA. CASSIA FISTULA (PURGING CASSIA).

Cathartocarpus Fistula, (*Linné*) *Persoon.*
(Cassia Fistula, *Linné.*) } The fruit.

Habitat. E. India, Egypt. Naturalized in Africa, W. Indies. Brazil. Cultivated.

Syn. Cassia Stick Tree, Pudding Pipe Tree, Drumstick Tree, Indian Laburnum. Br. Cassiæ Pulpa. Fr. Casse (en Bâtons) Mondée. Ger. Purgiercassie, Fistelkassie, Röhrenkassie.

Ca-thar-to-car'pus. L. fr. Gr. *καθαίρειν*, *καθαρτικός*, cleansing, purgative, + *καρπός*, fruit; *i. e.*, its medical property.

Fis'tu-la. L. *fistula*, a pipe, cane; *i. e.*, the resemblance of the long slender fruit.

Cas'si-a. Gr. *κασία*, fr. Heb. *qetsi-oth*, *qatsa*, cut; *i. e.*, bark of some species cut off and used; classical name of a bark allied to cinnamon.

PLANT.—Handsome tree, 9–15 M. (30–50°) high, bark gray; leaves paripinnate, alternate, large; leaflets opposite, 3–7 pairs, 5–15 Cm. (2–6′) long, ovate; flowers May–June, 2.5–5 Cm. (1–2′) wide, golden-yellow. FRUIT, cylindrical, .5–.6 M. (18–24′) long, 2.5 Cm. (1′) thick, pericarp blackish, veined, woody, with faint transverse striations, and a pronounced ridge the entire length down both ventral (groove) and dorsal (ridge) sutures, indehiscent, internally divided into 25–100 cells, each 1-seeded; seed flat, 8 Mm. (⅓′) long, imbedded in sweet, brownish pulp; odor resembling prunes, nauseating; taste sweet. Dose, ʒj–2 (4–8 Gm.).

Commercial.—Imported from E. and W. Indies, but mostly from the latter and S. America. Legumes that are heavy and do not rattle when shaken are best, as they contain most pulp (the official portion used), which should be at least 30 p. c. This is extracted by boiling in water, evaporating, or when fresh by removing pulp with knives; it becomes mouldy and sour by age.

CONSTITUENTS.—(of pulp): Sugar 60 p. c., mucilage, pectin, albuminoids, calcium oxalate.

PREPARATIONS.—1. *Confectio Sennæ*, 16 p. c. Dose, ʒj–2 (4–8 Gm.).

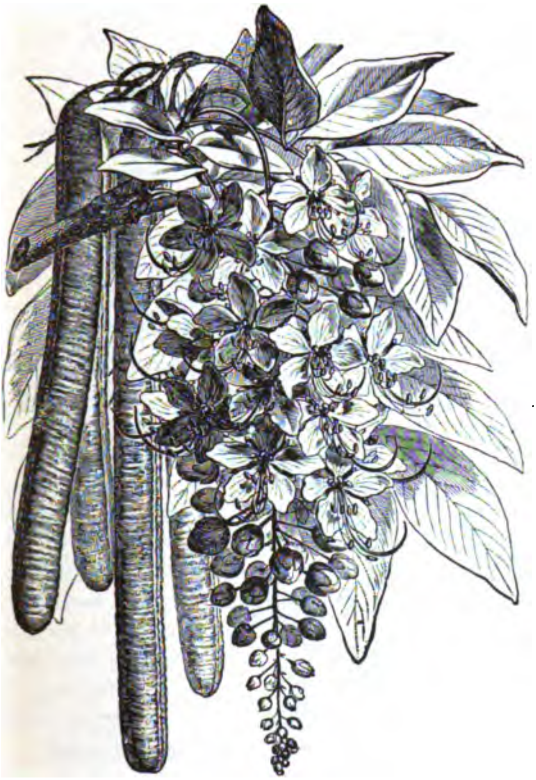
Unoff. Prep.: Confection (*Confectio Cassiæ*), 50 p. c.

PROPERTIES AND USES.—Laxative for costiveness, to promote flow of bile. Generally associated with other drugs (manna, tamarinds, salines, etc.), owing to its occasioning colic and flatulence.

Allied Plants:

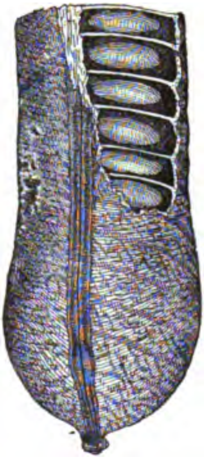
1. *C. moscha'ta*, Colombia. *C. bacilla'ris*, Dutch Guiana (Surinam). Both have fruit, .3–.5 M. (12–20′) long, 15 Mm. ($\frac{3}{5}$′) thick. *C. gran'dis* (*C. brasilia'na*), Brazil, fruit .6 M. (24′) long, laterally compressed, 4 Cm. (1½′) broad, blackish, coarsely veined, sutures prominent in three ridges. While the two former are lighter in color, all three have about the same properties as the official, except are more nauseating.

FIG. 174.



Cathartocarpus (Cassia) Fistula.

FIG. 175.



Cathartocarpus (Cassia) Fistula; part of pod, natural size.

SENNA. SENNA.

Cassia {**acutifolia**, *Delile*, **angustifolia**, *Vahl*.} The leaflets.

Habitat. E. and C. Africa, India.

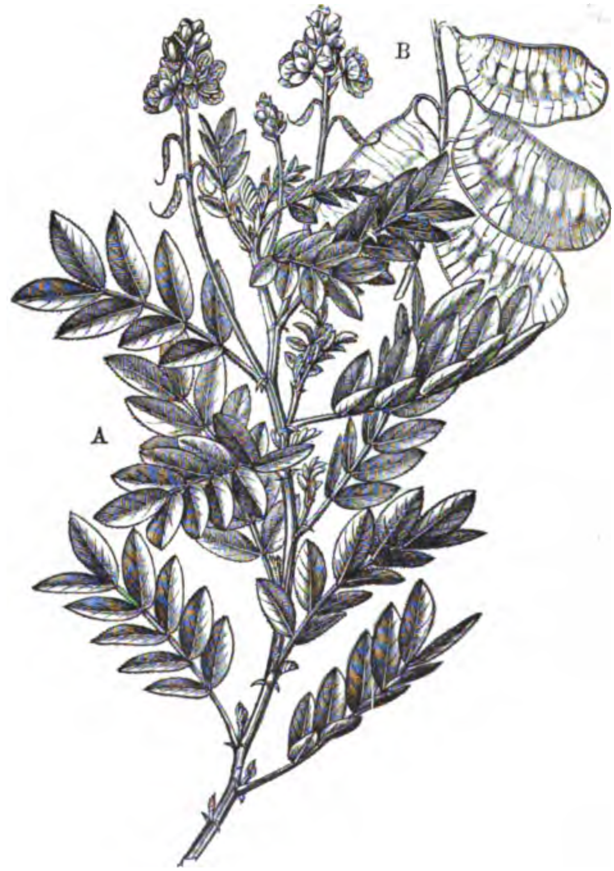
Syn. 1. Senna Alexandrina, Alexandrian or Nubian Senna. 2. Senna Indica, Arabian, Bombay, Mecca, Mocha, or Tinnevelly Senna. Fr. Feuilles de Séné. Ger. Sennesblätter.

A-cu-ti-fo'li-a. L. *acutus*, sharp, + *folium*, leaf; *i. e.*, leaves sharp pointed.

An-gus-ti-fo′li-a. L. *angustus*, narrow, + *folium*, leaf; *i. e.*, leaves narrow. **Sen′na.** L. fr. Ar. *sana*, *sena*. Hind. *sena*; *i. e.*, native Arabian plant name. This is the sub-genus of *Cassia*, but should have held full generic rank.

PLANT.—1. *Cassia acutifolia*, *Alexandria Senna*. Small shrub, .6–1 M. (2–3°) high; stem erect, woody, branching, whitish; flowers large, yellow, axillary racemes; fruit legume, 5 Cm. (2′) long, 18 Mm. (¾′) wide, flat, oblong, smooth, membranous, nearly straight, indehiscent, grayish-brown, bivalvular, 6–7-celled, each with a hard, cordate ash-colored seed; leaves alternate, 4–5 pairs, paripinnate, footstalks glandless, two small pointed stipules at base. LEAFLETS, lanceolate, 2.5 Cm. (1′) long, 10 Mm. (⅖′) broad, subcoriaceous, brittle, rather pointed, unequally oblique at base, entire, grayish-green, pubescent; odor peculiar; taste nauseous, bitter. Should be free from Argel (*Solenostem′ma A′rgel*) leaves, which are thicker, 1-veined, wrinkled, glaucous, even at base.

FIG. 176.

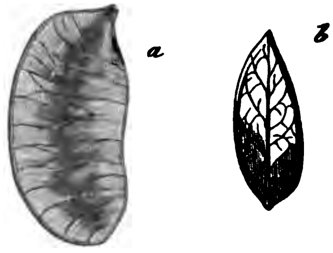


Cassia acutifolia; half natural size; A, leaflets; B, legumes.

2. *Cassia angustifolia* (*elongata*), *India Senna.* Plant like *acutifolia* except fruit 6 Cm. (2¼′) long, 15 Mm. (⅝′) broad, narrower, oblong, 8-seeded; leaves paripinnate, 5–8 pairs, sessile. LEAFLETS, lanceolate, acute, 2.5–5 Cm. (1–2′) long, 12–18 Mm. (½–¾′) broad, unequally oblique at base, entire, thin, yellowish-green or dull-green, nearly smooth; odor peculiar, tea-like; taste mucilaginous, bitter, nauseous. Should be without stalks, discolored leaves and other admixtures. *Solvents:* water or diluted alcohol extract the active constituent (*cathartic acid*), a prolonged decoction is inert, rendered more so by the addition of an alkali or acid. Leaves percolated with alcohol retain their reliable and pleasant cathartic power, being deprived of their griping resinous constituent, also odor, taste and color; this treatment, however, does slightly lessen the cathartic action. Dose, ʒss 3 (2–12 Gm.).

ADULTERATIONS.—*Alexandria* with: 1. *C. obovata*, leaflets, called by Arabs *Senna Baladi* (Wild Senna), and considered in Egypt less valuable than *Senna Jebeli* (Mountain Senna, *C. acutifolia*). 2. *Solenostemma Argel*, leaves which have lateral veins indistinct, leathery, wrinkled, bitter; flower buds present; fruit pear-shaped. .3. *Cra'cca* (*Tephro'sia*) *Apol-li'nea*, leaflets, S. Europe, uneven base, obovate, emarginate. 4. *Coria'ria myrtifo'lia*, leaves, and *Colu'tea arbore'-scens*, leaflets formerly used. 5. *Pods*, *leaf-stalks*, *branches*. All these are now carefully garbled out. The Arabians preferred the pods, as they contain 25 p. c. more cathartic acid than the leaflets, and no resin or volatile oil, hence do not gripe. Six or eight pods infused in ℥ij (60 Cc.) of water give adult purges.

FIG. 177.



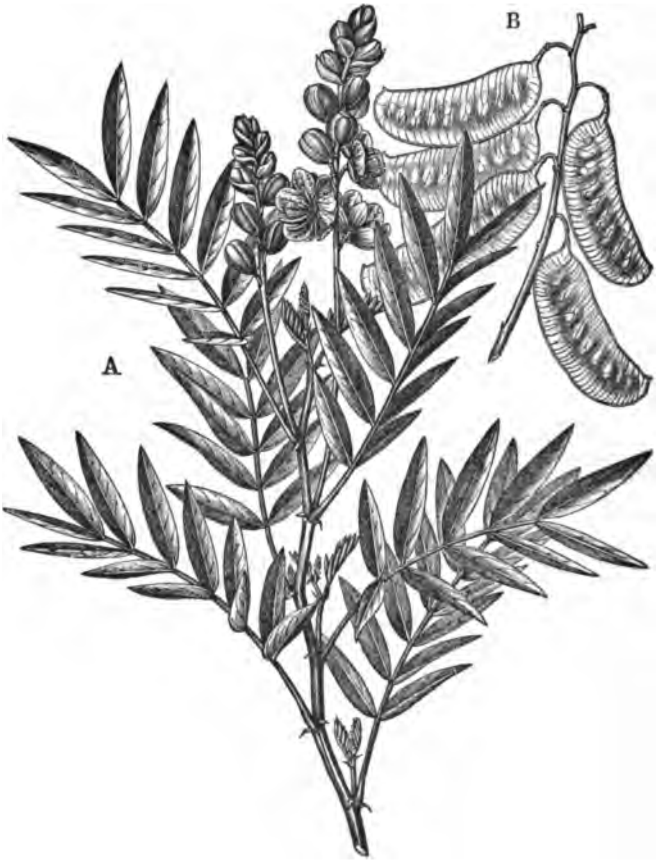
Cassia acutifolia; *a*, legume; *b*, leaflet, about natural size.

Commercial.—We have several varieties: 1. *Alexandrian*, *Nubian.* Chiefly from Nubia (Sennaar, Kordofan), but some from Timbuctoo, usually forwarded via Assouan, Darao, thence by the Nile to Cairo and Alexandria. Its botanic source has received various synonyms, as *Cassia acutifolia*, *C. lanceola'ta*, *C. leniti'va*, *C. officina'lis*, *C. æthio'-pica*, *C. orienta'lis*, etc. *Tripoli Senna*, from Tripoli (interior Africa), has no doubt the same botanic source; it is conveyed to market ports by caravans, and is as a rule much broken and discolored, being mixed with legumes, stalks and earthy matter, but no foreign leaves; seldom reaches our country, and by some restricted to *C. æthiopica* (*C. obovata*, *C. ova'ta*). These do not grow in Arabia or India.

2. *Indian*, *Arabian* (*Mocha*), *Tinnevelly.*—Originally produced in S. Arabia, but entered market via India (Bombay, Calcutta, etc.). The plant, *Cassia angustifolia* (*C. elonga'ta*, *C. me'dica*), although indigenous to Arabia, grows wild in the interior of Africa, and is extensively cultivated at Tinnevelly (from Arabian seeds), in S. India, where it be-

comes most luxuriant, furnishing the finest, as well as purest leaflets, owing to freedom from legumes, stalks, and other adulterations. These are mostly exported from Tuticorin, and Madras. *Bombay, E. India Senna,* is frequently sold as Tinnevelly, has the same source, but is less carefully dried, containing often small and discolored leaflets. *Arabian, Mecca Senna,* is often sold as Bombay, being collected and dried with even less care, as it contains many brown leaflets and legumes.

FIG. 178.



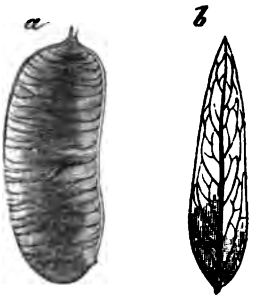
Cassia angustifolia. Half natural size ; A, leaflets ; B, legumes.

Senna yields two annual crops of leaflets; the larger (best) in September, at the end of the rains, the smaller in April, during the dry season. Natives cut the plants down, expose them upon rocks to the hot sun until dry, strip and pack the leaflets in palm-leaf bags, then convey these on camels to the market ports; here it is garbled, put into large bales, and thus sent into other countries.

Constituents.—Cathartic (cathartinic) acid, $C_{180}H_{96}N_2SO_{82}$, Sennapicrin, Sennacrol, Chrysophan, Phæoretin, sennit (cathartomannit, $C_{21}H_{44}O_{19}$, non-fermentable sugar), mucilage, ash 10–12 p. c.

Cathartic Acid.—The cathartic principle, being a glucoside of weak acid property existing in the plant as cathartates of calcium and magnesium, a form readily soluble in water. It is obtained by precipitating a concentrated infusion with an equal bulk of alcohol, filtering from mucilage and salts, and adding alcohol so long as precipitate is produced. Wash precipitate with alcohol, dissolve it in a little water, and remove albumin by a few drops of hydrochloric acid; completely precipitate filtrate with additional hydrochloric acid, and purify by dissolving in alcohol (60 p. c.) and precipitating with ether. It is black, amorphous, nearly insoluble in alcohol or water; salts soluble in water but insoluble in alcohol; mineral acids split it into glucose and cathartogenic acid.

Fig. 179.



Cassia angustifolia; *a*, legume; *b*, leaflet, about natural size.

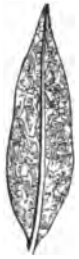
Sennapicrin.—Bitter principle (glucoside), insoluble in ether.

Sennacrol.—Acrid, resinous principle (glucoside), soluble in ether (causes griping).

Chrysophan and **Phæoretin.**—These are yellow coloring matters.

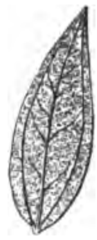
Preparations.—1. *Confectio Sennæ.* Confection of Senna. (Syn. Electuarium de Senna Compositum, Electuarium Lenitivum, Lenitive Electuary; Fr. Electuaire de Séné Composé; Ger. Senna Latwerge.)

Fig. 180.



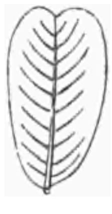
Argel leaf.

Fig. 181.



Coriaria leaf.

Fig. 182.



Cracca (Tephrosia) leaflet.

Manufacture: 10 p. c. Digest cassia fistula 16 Gm., tamarind 10, prune 7, fig 12, with water 65 Cc., strain, add sugar 55.5 Gm., evaporate to 89.5, then add senna 10, coriander oil 0.5 Cc. Dose, ʒj–2 (4–8 Gm.).

2. *Extractum Sennæ Fluidum.* Fluid Extract of Senna. (Syn., Fr. Extrait liquide de Séné; Ger. Flüssiges Senna-Extrakt.)

Manufacture: Macerate, percolate 10 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Prep.: 1. *Syrupus Sarsaparillæ Compositus,* 1.5 p. c. (fluid extract of senna). Dose, ʒj–4 (4–15 Cc.).

3. *Infusum Sennæ Compositum.* Compound Infusion of Senna. (Syn., Black Draught; Br. Infusum Sennæ; Fr. Tisane de Séné composée; Ger. Senna-Aufguss.)

Manufacture: 6 p. c. Macerate senna 6 Gm., fennel 2, in boiling water 80 Cc., strain, express, add magnesium sulphate 12 Gm., manna 12, strain, add cold water q. s. 100 Cc. Dose, ℥j–3 (30–90 Cc.).

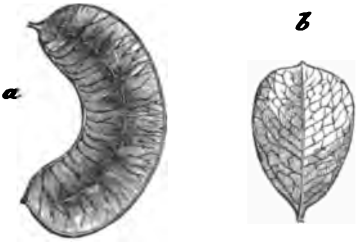
4. *Syrupus Sennæ.* Syrup of Senna. (Syn., Fr. Sirop de Séné; Ger. Sennasirup.)

Manufacture: 25 p. c. Alexandria senna 25 Gm., coriander oil 0.5 Cc., alcohol 15, sugar 70 Gm., water q. s. 100 Cc. Dose, ʒss–4 (2–15 Cc.).

5. *Pulvis Glycyrrhizæ Compositus,* 18 p. c. Dose, ʒss–2 (2–8 Gm.).

Unoff. Preps.: Extract. Dose, gr. 5–20 (.3–1.3 Gm.). *Tincture. Species Laxantes St. Germain.*

FIG. 183.



Cassia obovata; *a*, legume; *b*, leaflet, about natural size.

PROPERTIES.—Cathartic, acts on nearly the entire intestinal tract (especially colon), increasing peristalsis and intestinal secretion, except biliary; produces in four to six hours copious yellow stools, with griping and flatulence, does not cause hypercatharsis nor constipation. Large dose vomits, purges, with severe tenesmus, but never poisons. The odor acts as a cathartic on some very susceptible persons.

USES.—Arabians used it in skin troubles; now employed for habitual constipation, hemorrhoids, fissure ani, fevers. Its smell, taste, nauseousness, injurious effects in hemorrhoids, intestinal hemorrhage, and inflammation all check its popularity; its purgation increases with bitters, calumba, etc., while the griping and nausea are diminished by coriander, tamarind, manna, fennel, Epsom or Rochelle salt. If leaves macerate long in water, or if the mass be pressed tightly, much acrid, resinous principle will be obtained, causing considerable griping, hence should exhaust by rapid percolation.

Allied Plants:

1. *Ca'ssia obova'ta.*—Leaflets official, 1830–1870. This was the first senna known, being introduced by the Moors into Europe, as early as the ninth century, where even in the sixteenth it became largely cultivated. Grows wild on sandy soil in Egypt, Nubia, Abyssinia, Tripoli, Senegal, Arabia, India, cultivated in Jamaica being called *Port Royal* or *Jamaica Senna.* Leaves 5–7 pairs, leaflets obovate, obtuse.

2. *Cassia maryla'ndica.*—Leaflets official, 1820–1880. United States, New England to S. Carolina, west to the Mississippi. Plant

1–1.5 M. (3–5°) high; leaves alternate, leaflets, paripinnate, 8 pairs, 2.5–5 Cm. (1–2′) long, 12 Mm. (½′) wide; flowers August, yellow; fruit pod, 7.5 Cm. (3′) long; in sandy soil, river banks, introduced into England in 1723, cultivated for ornament, collected in August–September. Contains cathartic acid, volatile oil, and given in one-third larger doses than official; in infusion.

3. *C. pube′scens* (*C. holoseri′cea*), *Aden Senna.*—Abyssinia, rarely met with now; leaflets 2.5 Cm. (1′) long, ovate, mucronate, hairy, sometimes mixed with Mecca senna. *C. bre′vipes.* C. America; leaflets resemble India senna, but have three longitudinal veins; infusion non-purgative.

TAMARINDUS. TAMARIND.

Tamarindus indica, *Linné.* } The preserved pulp of the fruit.

Habitat. India, Africa, Nubia, Abyssinia (naturalized in W. Indies, Jamaica).

Syn. Black (E. India) Tamarinds. Indian Dates. Fr. Tamarinier (pulpe). Ger. Pulpa Tamarindorum Cruda. Fructus Tamarindorum. Tamarindenmus.

Tam-a-rin′dus. L. fr. Ar. *tamr Hindi*, the Indian date, *tamr*, date. Heb. *tamar*, a palm tree, + *Hindi*, Indian, *Hind*, India; *i. e.*, its native name.

In′di-ca. L. *indicus*, Gr. Ινδικός, pertaining to India; *i. e.*, flourishes natively there.

Tam′a-rind. E. simply a contraction of the Arabic name.

Plant.—Large, handsome tree, 18–24 M. (60–80°) high, branches widely spreading, bark rough, ash-colored, twigs smooth or pubescent; leaves paripinnate, alternate; leaflets 8–16 pairs, sessile, 12–25 Mm. (½–1′) long, 6 Mm. (¼′) broad, entire, unequal at base, oblong, yellowish-green; flowers yellow, calyx yellow, petals yellow with red veins, lateral racemes. Fruit, indehiscent legume, pendulous, compressed, 7.5–15 Cm. (3–6′) long, 2.5 Cm. (1′) wide, curved, smoothish, chocolate-brown, pericarp thin, corky, which being removed the remainder constitutes commercial tamarind—reddish-brown, sweet, subacid, pulpy mass, containing strong, branching fibers, and polished, brown, flattish-quadrangular seeds (3–10), each enclosed in a tough membrane; taste sweet, refreshingly acidulous. Bright iron left in contact with moist pulp thirty minutes should not yield reddish deposit of copper. Dose, ʒss–5 (2–20 Gm.).

Commercial.—This beautiful tree flourishes in forests and by cultivation for its fruit, shade, and sweet-scented flowers. We have three varieties: 1. *W. Indian*, *Brown*, *Red*, official. Shells are removed and the inner part of the fruit is pressed or worked into cakes with sugar or hot syrup. Sometimes alternate layers of pulp and sugar are met with, or a somewhat homogeneous mass, as a result of boiling in copper vessels; enters market in jars.

2. *E. Indian*, *Black.*—Firm, clammy, black masses, consisting of seeds, pulp, fibres and shell remains pressed together and dried by the sun, thus being preserved usually without sugar or syrup; has strong acid taste.

3. *Egyptian.*—Flat, round cakes, 10–20 Cm. (4–8′) wide, 2.5–5 Cm. (1–2′) thick, firm, black, prepared by kneading the softer parts

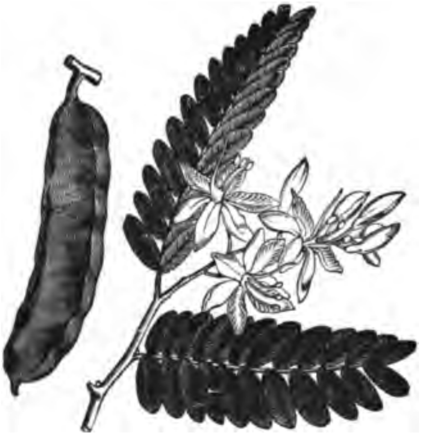
without sugar, very acid, frequently mouldy. The last two seldom reach this country.

CONSTITUENTS.—Tartaric acid 5–9 p. c., Citric acid 4–6 p. c., Potassium bitartrate 5–6 p. c., malic acid, acetic acid (mostly as potassium salts), sugar, pectin, tannin (in seed-testa), insoluble matter 12–20 p. c.

PREPARATIONS.—1. *Confectio Sennæ*, 10 p. c. Dose, ʒj–2 (4–8 Gm.).

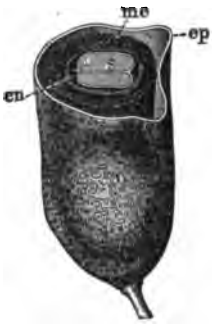
Unoff. Preps.: Conserve (*Conserva Tamarindi*), 25 p. c. *Infusion.* *Whey.* *Tamar Indien* (confection of senna with oils of anise and lemon).

FIG. 184.



Tamarindus indica.

FIG. 185.



Tamarind fruit; cross-section; *ep*, epicarp; *me*, mesocarp; *en*, endocarp; *s*, seed.

PROPERTIES.—Laxative, refrigerant.

USES.—The Arabians employed it in malaria, also to heal aphthous sores, correct nausea, quench thirst and allay febrile excitement. Now employed mainly as a cooling drink in febrile diseases. They should be mixed with hot water (infusion) or boiled with milk (whey) and drank after the strained liquid has cooled. Usually combined with other laxatives, as a flavoring, which is claimed by some to lessen their cathartic power. Fresh leaves and flowers being acid, are used natively for preparing cooling drinks; the seeds as astringent in bowel affections, and the kernels as a food.

HÆMATOXYLON. HÆMATOXYLON (LOGWOOD).

Hæmatoxylon campechianum, *Linné.* } The heart-wood.

Habitat. C. America, naturalized in W. Indies, Jamaica, St. Domingo.

Syn. Blackwood, Campeachy Wood or Logwood. Jamaica, Honduras or St. Domingo Logwood, Lignum Cœruleum. Fr. Bois (de Campêche) de Sang, d'Inde. Ger. Blauholz, Blutholz, Campecheholz.

CÆSALPINACEÆ.

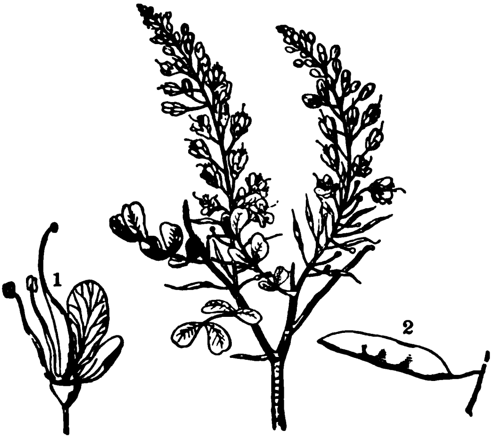
Hæ-ma-tox′y-lon. L. fr. Gr. αἷμα(τ), blood, + ξύλον, wood; *i. e.*, color of the duramen.

Cam-pe-chi-a′num. L. Campeachy, of or belonging to Campeachy Bay; *i. e.*, its habitat.

Log′wood. So-called from being imported in logs.

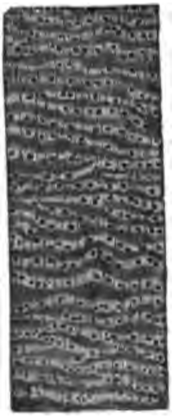
PLANT.—Small spreading tree, 7.5–12 M. (25–40°) high, .3–.6 M. (1–2°) thick; branches crooked; bark dark, rough, white dotted; leaves paripinnate; leaflets 4–5 pairs, obcordate, smooth; flowers small, calyx purple, corolla yellow, perfume of jonquil, racemes; fruit legume 2.5–4 Cm. (1–1½′) long, flattish, both ends tapering, 2-seeded. HEART-WOOD, in logs 1 M. (3°) long, 15 Cm. (6′) or more thick, heavy, sp. gr. 1.06; hard, purplish-black, internally brownish-red marked with irregular concentric circles, splitting irregularly; odor faint, agreeable; taste sweetish, astringent; when chewed colors saliva dark-pink. In shops as small chips and coarse powder, dark-brownish-red color, often with a greenish lustre (hæmatein). *Tests:* With alkalies have purple color; if Brazil wood red, if red saunders no change. *Solvents:* boiling water; alcohol. Dose, ʒss–1 (2–4 Gm.).

FIG. 186.



Hæmatoxylon campechianum: 1, flower; 2, fruit.

FIG. 187.



Lignum campechianum; cross-section magnified 4 diam.

Commercial.—Trees, growing mostly on the shores of Campeachy Bay, are felled when ten years old, deprived of bark and sapwood (alburnum), leaving the heart-wood (duramen) to be cut into logs and alone sent into market. We have four varieties according to habitat: 1. *Campeachy,* 2. *Honduras,* 3. *St. Domingo,* 4. *Jamaica,* named in order of value. The tree, by cultivation will grow in our Southern States, but there rarely ever flowers. The chips when old, from exposure of surface to atmosphere (having trace of ammonia), become more or less coated with a greenish substance, hæmatein, into which hæmatoxylin has oxidized by parting with two atoms of hydrogen, consequently fresh and old chips yield different coloring constituents.

CONSTITUENTS.—Hæmatoxylin, Volatile oil, Tannin, fat, resin.

Hæmatoxylin (*hæmatin*), $C_{16}H_{14}O_6$.—Is obtained by mixing powdered extract with sand, exhausting with ether; recover ether, add water, crystallize—adding a little sulphurous acid or a sulphite, to prevent oxidation; yield 12 p. c. It is pale-yellow, sweet, like liquorice, soluble in alcohol, water, reddened by sunlight, yields pyrogallol when fused with potassa, by fermentation get hæmatein, $C_{16}H_{12}O_6$, which can be reconverted into hæmatoxylin by hydrogen or sulphurous acid. The extract contains both hæmatoxylin and hæmatein; must avoid iron vessels in all manipulations.

PREPARATIONS.—1. *Extractum Hæmatoxyli.* Extract of Hæmatoxylon. (Syn., Extractum Ligni Campechiani; Fr. Extrait de Bois de Campêche; Ger. Campecheholz-Extrakt.)

Manufacture: Macerate 10 Gm. with water 100 Cc., forty-eight hours, boil to 50, strain, evaporate to dryness; yield 12 p. c. Dose, gr. 5–15 (.3–1 Gm.).

Unoff. Preps.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Fluid Extract.* Dose, ♏x–60 (.6–4 Cc.).

PROPERTIES.—Similar to tannin, astringent, tonic, antiseptic. Darkens feces, makes urine sweet and blood-red. Constipates less than pure astringents.

USES.—Cholera infantum, chronic diarrhœa, leucorrhœa, dysentery, dyspepsia, hemorrhage; may cause phlebitis. Antiseptic in gangrenous sores, indolent ulcers, cancer. Mainly used in dyeing violet, blue, gray and black colors, giving to the latter a lustre and velvety appearance.

Allied Plant:

1. *Erythrophlœ'um guinee'nse, Sassy, Mancona* or *Ordeal Bark.*—W. and C. Africa. Large tree with spreading branches, doubly pinnated leaves. Bark flat or curved, 5 Mm. ($\frac{1}{5}'$) thick, warty, fissured, hard, dull-red with whitish spots, brittle, transverse cut shows fawn-colored spots, inodorous, astringent. Contains erythrophleine (heart tonic, anæsthetic, poisonous), manconine, tannin. Cardiac tonic, local anæsthetic, astringent, diaphoretic, narcotic, sternutatory; occasions slow, strong pulse. Dose of erythrophleine hydrochlorate, gr. $\frac{1}{32}$–$\frac{1}{16}$ (.002–.004 Gm.).

COPAIBA. COPAIBA (BALSAM OF COPAIBA).

Copaiva Langsdorffii, (*Desfontaines*) *Kuntze,* and other species. } The oleoresin.

Habitat. Brazil (Venezuela, Colombia), Amazon Valleys, banks of the Orinoco River.

Syn. Balsam Capivi. Fr. Copahu, Oleo-résine (Baume) de Copahu. Ger. Balsamum Copaïvæ, Copaiva-balsam.

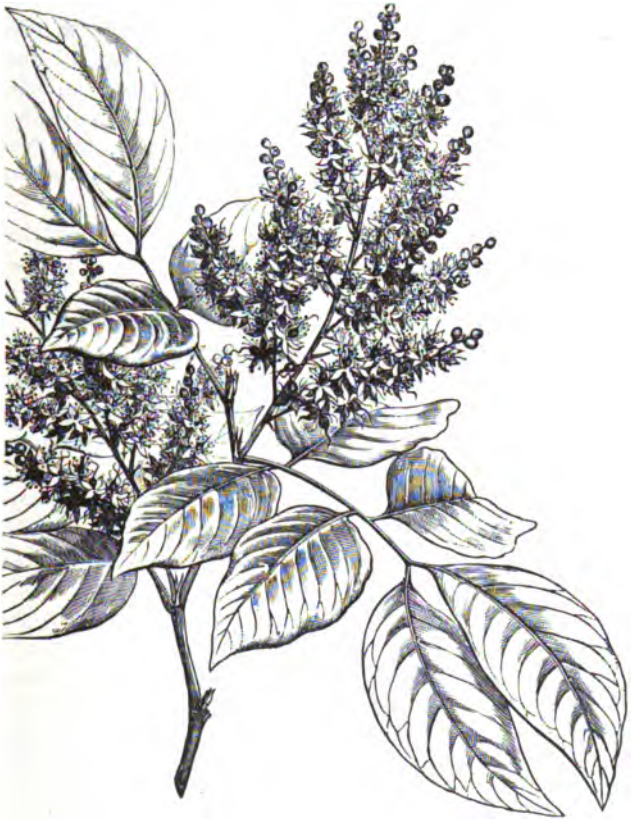
Co-pai'va. L. Sp. and Pg. fr. Brazil *cupauba; i. e.,* native name of the tree and its product.

Langs-dorf'fi-i. L. after M. Langsdorff, Russian Consul-General at Rio, 1829, from whom Desfontaines received his specimens.

CÆSALPINACEÆ.

PLANT.—Small tree, although sometimes 18 M. (60°) high, much branched, bark brown, rather smooth; leaves alternate, paripinnate; leaflets opposite, 3–5 pairs, 2.5–5 Cm. (1–2′) long, ovate, entire, glabrous, coriaceous, pellucid-punctate; flowers small, white; sepals 5; apetalous; stamens 10; pod small, 2.5 Cm. (1′) long, orange-brown, dehiscent into 2 valves, 1-seeded. OLEORESIN (copaiba), viscid liquid, brownish-yellow, transparent, sp. gr. 0.940–0.990; odor characteristic; taste bitter, acrid; soluble in alcohol, ether, chloroform, benzin, carbon disulphide, fixed and volatile oils; insoluble in water. *Tests:* 1. When heated should not give turpentine odor. 2. Forms clear solution (not milky) with 4 volumes alcohol, or 10 of benzin (abs. Venice turpentine, linseed oil, gurjun balsam). 3. When oil evaporated the cold residue should be amorphous, transparent, brittle (abs. fixed oils); if such be present have soft, sticky residue, which saponifies with potassa, leaving a greasy spot on paper; when other than castor oil, neither copaiba nor residue gives clear solution with

FIG. 188.



Copaiba Langsdorffii.

alcohol. 4. 1 drop + 19 of carbon disulphide, shaken with 1 of nitric and sulphuric acids mixed, should give no purplish-red or violet color (abs. gurjun balsam), which, if present, renders copaiba fluorescent and gelatinous upon heating; if oleoresin *Hardwi'ckia pinna'ta* present the same reagents give pale-greenish-yellow color. Dose, ♏x–60 (.6–4 Cc.).

ADULTERATIONS.—Oleoresins of allied species, oil of turpentine and other volatile oils, resin, rosin oil, linseed oil, castor oil and other fixed oils, Venice turpentine, gurjun balsam, alcohol.

Commercial.—During 1625 and 1638 considerable was written concerning copaiba, but in 1648 Marcgrav and Piso first described its collection, also the tree; Jacquin studied the genus in 1760, as did Desfontaines some years later; while in 1827 Hayne, and in 1870 Bentham separated, in Brazil alone, 11 species by their varying foliage, all having similar flowers and fruit. Nearly all the oleoresin, however, is from six species, viz: *C. officina'lis* (Carthagena), *C. Langsdo'rffii* (Sao Paulo), *C. multiju'ga* (Para), *C. guiane'nsis* (Rio Negro), *C. coria'cea* (Sao Paulo), *C. niti'da* (Minas Geræs).

Collection.—Copaiba collects in ducts, being obtained by making large auger holes or boxes (square or wedge-shaped) into the centre of the tree's stem, near the base, from which it usually flows at once, giving 12 lbs. (5.5 Kg.) in three hours; if none should appear the wound is closed with clay or wax and reopened in two weeks, whereupon, as a rule, it discharges abundantly. Old trees may furnish 2–3 flows yearly, and when abandoned, these ducts, sometimes the length of the stem, occasionally fill, and thus acting as high liquid columns, furnish sufficient pressure to burst the trunk with a cannon-like report. The first flow is thin, clear, colorless, which shortly becomes thicker and yellowish; it also thickens by age. A tree may yield 10–12 gallons (38–45 L.) and its value turns upon the contained amount of volatile oil. We have several commercial varieties:

1. *Para.*—The most limpid and pale colored; contains volatile oil 60–90 p. c.

2. *Maranham.*—Odor slightly different, somewhat denser, having consistence of olive oil; contains volatile oil 40–60 (rarely 80) p. c.

3. *Rio Janeiro.*—Resembles very closely the Maranham. These three (Brazilian) form clear mixtures with one-third to one-half their weight of ammonia water, but milky if more alkali or fixed oil present.

4. *Maracaibo.*—This is the thickest, being dark-yellow and turbid; contains volatile oil 20–40 p. c.; solidifies with magnesia, not clear with ammonia. Copaiba is exported not only from the above ports, but from Angostura, Cayenne, W. Indies, in casks, demijohns, cans, jugs, etc.

CONSTITUENTS.—Volatile oil, Resin, bitter principle, copaivic acid, $C_{20}H_{30}O_2$ (oxycopaivic acid, $C_{20}H_{28}O_3$, from Para; Metacopaivic acid, $C_{22}H_{34}O_4$, from Maracaibo; all three acids crystalline). Has no benzoic or cinnamic acid, hence the name balsam is misapplied.

Oleum Copaibæ. Oil of Copaiba, $C_{15}H_{24}$, *official.*—(Syn., Fr.

Essence de Copahu; Ger. Copaibaöl.) This volatile oil is distilled from copaiba with water or steam, and upon it most of the medical properties of oleoresin depend. It is a pale-yellowish liquid, characteristic odor, aromatic, bitter, pungent taste; consists chiefly of caryophyllene, $C_{15}H_{24}$; sp. gr. 0.900, increasing with age, soluble in 10 volumes alcohol, with slight turbidity; that from Maracaibo dark-blue with hydrochloric acid gas. Oil should be kept cool, in well-stoppered bottles. Dose, ♏v–15 (.3–1 Cc.), in emulsion, capsule, or on sugar.

Resina Copaibæ. Resin of Copaiba, *official.*—(Syn., Acidum Copaibicum; Fr. Acide Copahuvique; Ger. Copaivasäure.) The residue left after distilling off the volatile oil from copaiba. It is brownish-yellow, brittle, slight odor and taste of copaiba to which it returns when mixed with its volatile oil; soluble in alcohol, ether, chloroform, benzene, volatile oils; contains copaivic, or metacopaivic acid, mixed with neutral resin. Dose, gr. 5–15 (.3–1 Gm.).

PREPARATIONS.—1. *Massa Copaibæ.* Mass of Copaiba. (Syn., Solidified Copaiba, Pilulæ Copaibæ; Fr. Masse pilulaire de Copahu; Ger. Copaiva-Pillenmasse.)

Manufacture: 94 p. c. Triturate magnesia 6 Gm. + water q. s. for dampness, add copaiba 94, heat half an hour, frequently stirring. Dose, gr. 15–60 (1–4 Gm.).

Unoff. Preps.: Emulsion. Electuary. Pills. Suppositories. Capsules.

PROPERTIES.—Similar to turpentine; diuretic, stimulant, expectorant, laxative, nauseant, disinfectant; acts mainly on the mucous membranes (genito-urinary) by which, and also skin, it is eliminated; increases quantity as well as solids of the urine, and imparts odor to urine, sweat, milk, breath; sometimes erupts the skin—roseola, urticaria, etc.

USES.—Gonorrhœa, cystitis, bronchitis, dysentery, diarrhœa, hemorrhoids, psoriasis, dropsy, leprosy. Volatile oil is not so good for gonorrhœa, gleet, etc., as the oleoresin, but better for throat affections. Externally, chilblains, sore nipples, anal fissures, often added to varnishes and *vice versa.* Long usage may cause indigestion and renal irritation.

Poisoning, Incompatibles, Synergists: Same as for turpentine.

Allied Plants:

1. *C. Ma'rtii, C. cordifo'lia, C. Ju'ssieui, C. Jacquini.*—All furnish oleoresin, usually poor in the amount of volatile oil.

2. *Hardwi'ckia pinna'ta.*—E. India. Tree yields dark-brown oleoresin, containing volatile oil 20–40 p. c., resin, no copaivic acid.

3. *Dipteroca'rpus ala'tus.*—India. Tree yields gurjun balsam or wood oil—an oleoresin resembling copaiba, containing gurjunic (metacopaivic) acid.

4. *Copal, Gum Copal.*—A fossil resin of Zanzibar or exuding from many leguminous plants of Africa, S. America, W. Indies. Occurs in yellowish-brown masses, wrinkled surface, conchoidal fracture, glossy, odorless, tasteless. When melted becomes soluble in alcohol,

ether, and oil of turpentine. Same medical properties as copaiba, only weaker. Used mainly in preparing varnishes.

41. KRAMERIACEÆ. Krameria Family.

Kra-me-ri-a′se-e. L. *Krameri-a* + aceæ, in honor of Drs. J. G. H. and W. H. Kramer, German botanists, of the last century. Pubescent herbs, shrubs. Distinguished by leaves simple, exstipulate; flowers purplish, racemes, sepals large, 4–5, petals 4–5, smaller than sepals, stamens 3–4, monadelphous; ovary 1-celled, ovules 2; fruit spiny, indehiscent, 1-seeded; temperate climates, tropics; astringent, tonic, dye, ornament.

Genus: 1. **Krameria.**

KRAMERIA. KRAMERIA (RHATANY).

Krameria $\left\{\begin{array}{l}\textbf{triandra}, \textit{Ruiz et Pavon},\\ \textbf{Ixina}, \textit{Linné}.\end{array}\right\}$ The root.

Habitat. 1. Peru, Bolivia. 2. Colombia (in sandy localities of the mountains, elevation 925–2,465 M. (3,000–8,000°)).

Syn. W. India, Para or Savanilla Rhatany (*K. Ixina*). Fr. Ratanhia. Ger. Radix Ratanhiæ, Ratanhiawurzel.

Kra-me′ri-a. L. see etymology, above, of Krameriaceæ.

Tri-an′dra. L. fr. Gr. *τρι*, three, + *ἀνδρός*, man, stamen; *i. e.*, flowers have three stamens.

Ix-i′na. L. fr. native name *Ixine*, at Cumana, Venezuela, where Lœfling discovered the plant in 1754.

Rhat′a-ny. Fr. Peru, *ratana*, native name; Sp. *ratania*, *ratana*, creeping; *i. e.*, the plant's habit.

PLANTS.—Low shrubs with spreading, decumbent branches; bark grayish-brown, when young hoary with erect silky hairs; leaves sessile, densely covered on both sides with adpressed silvery hairs, 12 Mm. ($\frac{1}{2}'$) long, obovate, entire; flowers Oct.–Nov., 18 Mm. ($\frac{3}{4}'$) broad, red; sepals 4, scarlet, in form of a cross; petals 4, dissimilar, red; fruit, size of a pea, 6 Mm. ($\frac{1}{4}'$) thick, covered with stiff, reddish-brown prickles, 1–2-seeded. ROOT, knotty, several-headed above, 1–2.5 Cm. ($\frac{1}{2}$–1′) thick, 5–10 Cm. (2–4′) long (*short*), here dividing into two or more spreading branches .3–.6 M. (1–2°) long (*long*): bark smooth, or scaly in the thinner pieces, rusty-brown, 1–2 Mm. ($\frac{1}{24}$–$\frac{1}{12}'$) thick; very astringent; inodorous; wood pale-brownish-red, tough, with fine medullary rays, nearly tasteless, that of *K. Ixina* less knotty, more slender, with bark dark-purplish-brown, 3 Mm. ($\frac{1}{8}'$) thick. *Solvents:* cold water; boiling water; alcohol. Dose, gr. 5–30 (.3–2 Gm.).

Commercial.—We have two important varieties:

1. *Payta, Peruvian, Red Rhatany* (*K. triandra*).—Abundant around Huanuco and Lima, mainly shipped from Payta.

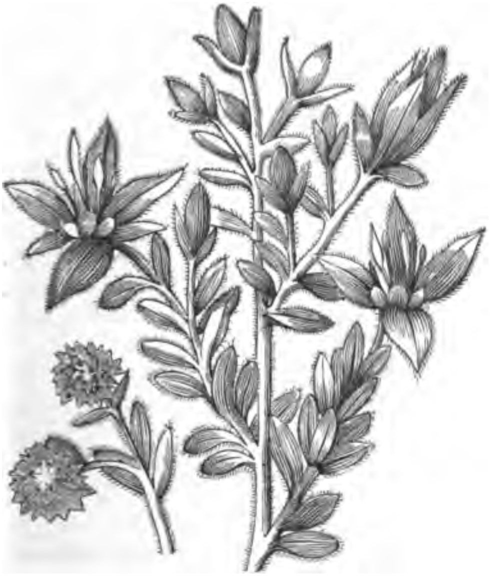
2. *Savanilla, New Granada, Antilles, Violet Rhatany* (*K. Ixina*).—This abounds in Colombia, Venezuela, Guiana, Brazil, Hayti, Antigua, Mexico. Of this species we have several varieties

collected indiscriminately and so used : 1. Var. *granate'nsis ;* this is distinguished solely by its broader leaves. 2. Var. *tomento'sa ;* this is an extremely woolly form and thought by some deserving of specific rank (*K. tomento'sa*), not only shipped from Savanilla but also from Carthagena, Santa Marta, etc.), most of this is now from *K. arge'ntea*, Brazil. Constituents are mostly in the bark, hence the thick-barked root, with little wood, is preferred. Roots are dug after rains, mostly in S. Peru, especially in Arica and Islay provinces.

CONSTITUENTS.—Kramero-tannic acid 20 p. c., Rhatanic-red, (starch, sugar, gum, wax, calcium oxalate).

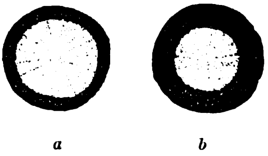
Kramero-tannic Acid (*krameria* or *ratanhia-tannic acid*).—Obtained by treating ethereal extract of bark with alcohol and evaporating this latter solution. It is a red, amorphous powder, precipitated dark-green by ferric salts and flesh-colored by gelatin ; no precipitate from tartar emetic, but fused with potassa yields protocatechuic acid and phloroglucin. Alcoholic tincture of Payta gives with lead acetate red-brown, that of Savanilla and Para bluish-gray precipitate.

FIG. 189.



Krameria triandra.

FIG. 190.



Krameria ; transverse sections ; root ; *a*, Peruvian ; *b*, Savanilla.

Rhatanic-red (*ratanhia-red*), $C_{26}H_{22}O_{11}$.—Obtained by boiling kramero-tannic acid with dilute sulphuric acid when it splits into glucose and this coloring principle, which is similar to that found in horse-chestnut and tormentilla.

PREPARATIONS.—1. *Extractum Krameriæ.* Extract of Krameria. (Syn., Fr. Extrait de Ratanhia ; Ger. Ratanhia-Extrakt.)

Manufacture : Percolate with water. Dose, gr. 5–10 (.3–.6 Gm.).

Prep.: 1. *Trochisci Krameriæ.* Troches of Krameria. (Syn., Fr. Pastilles (Tablettes) de Ratanhia; Ger. Ratanhiapastillen.)

Manufacture: Extract of krameria 6 Gm., sugar 65, tragacanth 2, stronger orange flower water q. s. 100 troches. Dose, 1 troche occasionally.

2. *Extractum Krameriæ Fluidum.* Fluid Extract of Krameria. (Syn., Fr. Extrait liquide de Ratanhia; Ger. Flüssiges Ratanhia-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol 90 Cc., glycerin 10, and finally diluted alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Prep.: 1. *Syrupus Krameriæ.* Syrup of Krameria. (Syn., Fr. Sirup de Ratanhia; Ger. Ratanhiasirup.)

Manufacture: Fluid extract of krameria 45 Cc., syrup 55 Cc. Dose, ʒss–4 (2–15 Cc.).

3. *Tinctura Krameriæ.* Tincture of Krameria. (Syn., Fr. Teinture de Ratanhia; Ger. Ratanhiatinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Similar to tannic acid, astringent, tonic.

USES.—Chronic diarrhœa, stomach and intestinal hemorrhage, leucorrhœa, dysentery, gleet, gonorrhœa, ozæna, menorrhagia, fissure of anus or nipple, incontinence of urine. Externally, gargle for sore-throat, mucous membranes of eyes, nose, gums, epistaxis, rectal bleeding, relaxed uvula, tooth powder and wash. Generally used locally by injection, gargle, wash, enema (extract 2 p. c. in water).

Allied Plants:

1. *K. arge'ntea, Para, Brazilian, Ceara, Brown Rhatany.*—Resembles *K. Ixina,* but is darker, less purple—brownish-gray, very flexible, bark transversely fissured, warty. *Guayaquil Rhatany* (origin unknown), root large, contorted, bark thin, fibrous, rich in tannin, reddish-brown, striated, warty.

2. *K. secundiflo'ra (lanceola'ta), Texas Rhatany.*—Roots valuable, thin, dark-brown, bark thick, rich in tannin. *Florida Rhatany.* Same source, and similar to Texas; neither on the market.

42. PAPILIONACEÆ. Pea Family.

Pa-pil-i-o-na'se-e. L. *Papilio(-n)* + aceæ, butterfly; *i. e.,* alluding to the corolla being butterfly-shaped. Herbs, shrubs, vines, trees. Distinguished by leaves compound, stipulate; flowers papilionaceous, calyx 4–5-toothed, petals perigynous or hypogynous, upper one enclosing the lateral ones in the bud, stamens usually 10; pistil 1, ovary 1-celled; fruit legume or loment, 1–many-seeded; universal; astringent, antispasmodic, demulcent, sedative, dye, poisonous, timber.

Genera: 1. **Toluifera.** 2. **Astragalus.** 3. **Pterocarpus.** 4. **Glycyrrhiza.** 5. **Cytisus.** 6. **Vouacapoua (Andira).** 7. **Physostigma.**

BALSAMUM PERUVIANUM. BALSAM OF PERU.

Toluifera Pereiræ, (*Royle*) *Baillon.* } A balsam.

Habitat. Central America (San Salvador) in woods near the coast.

Syn. Balsamum Peruvianum Nigrum, Balsamum Indicum, Black Balsam. Fr. Baume (de Pérou)—des Indes. Ger. Perubalsam.

To-lu-if'e-ra. L. *tolu* + *fero*, *ferre*, to bear, producing tolu or an allied balsam; *i. e.*, it was first brought from Tolu, now Santiago de Tolu in U. S. Colombia.

Per-ei'ræ. L. of Pereira; *i. e.*, in memory of Jonathan Pereira (1804–1853), the eminent author of "*Elements of Materia Medica,*" and Prof. to the Pharmaceutical Society, who visited S. America to study these and many other plants.

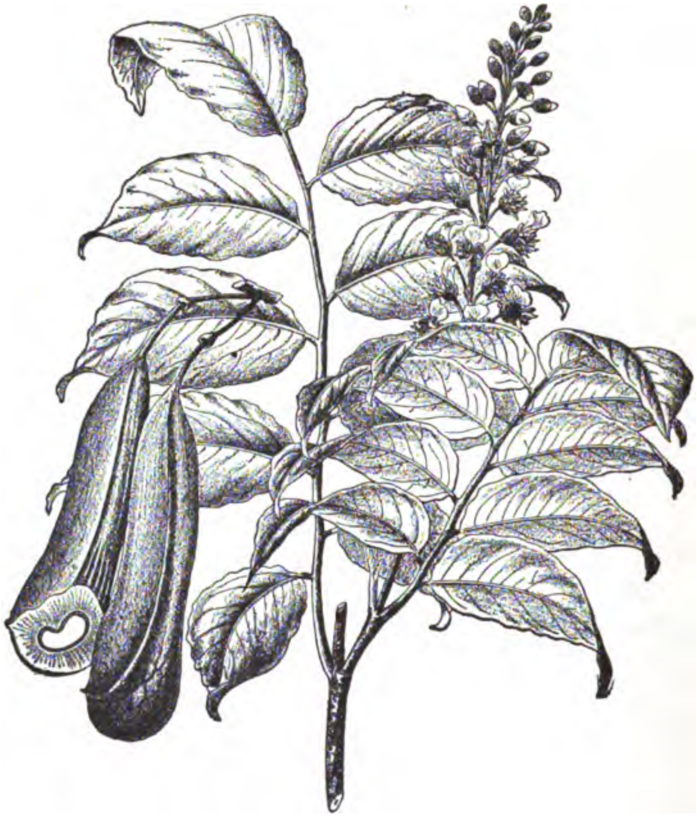
PLANT.—Handsome tree, 15 M. (50°) high, branching 2.5 M. (8°) above ground; leaves 6–10, alternate, 15–20 Cm. (6–8′) long, imparipinnate; leaflets 5 7.5 Cm. (2–3′) long, oblong-ovate, hairy, puckered margin; flowers 12 Mm. (½′) long, whitish, tomentose, racemes; fruit 1-seeded legume 10 Cm. (4′) long, yellowish-brown. BALSAM (of Peru), a pathologic product, thick, brownish-black, syrupy, transparent liquid, non-viscous; smoky vanilla odor; persistent bitter taste, not hardening upon exposure, sp. gr. 1.145, acrid, soluble in chloroform, alcohol, or glacial acetic acid. *Tests:* 1. With 10 drops + sulphuric acid 20 drops, should get reddish tough mass, which when washed with cold water yields a brittle resinous mass (abs. fixed oils and oleo-resins); 2. When distilled no volatile oil should go over (abs. volatile oils and copaiba); 3. If 2 parts + 1 part of slaked lime are triturated on water bath the mixture should not solidify nor have fatty odor (abs. rosin, fatty oils); 4. For alcohol, distil balsam with water, add to distillate while hot iodine and potassa, when cold iodoform crystals form. Dose, ♏v–30 (.3–2 Cc.).

ADULTERATIONS.—Alcohol, fixed and volatile oils, castor oil, storax, gurjun balsam, copaiba, Canada turpentine, rosin.

Commercial.—Balsam of Peru was long considered to be from *Myro'xylon perui'ferum*, a Brazilian tree, whose product reached Europe via Peru, hence its name. This, however, is a distinct species, flourishing in Ecuador, Peru, Brazil, and yields a fragrant balsam resembling Tolu, called at Rio, *Olea Vermelho.*

Collection.—The trees are in forests, but each, by its owner is scrupulously watched and treated or tapped. They do not thrive above 300 M. (1,000°) elevation and begin yielding balsam when five years old continuing for thirty or more thereafter. The aroma of the flowers can be readily perceived when several hundred feet away. The aborigines collect it in a district reserved to them, called *Sonsonate* or *Balsam Coast*, extending from Acajutla to Port Libertad. In Nov.–Dec., when the dry season begins, the bark for some distance up the trunk is beaten with a blunt mallet or back of an axe in four alternating sections, so as not to kill the tree. This loosened bark soon splits, and within a week is slightly warmed, or set on fire and charred. During the next week that which has not fallen off is removed, and the bare wood covered with raw-cotton or rags to absorb exuding balsam, which when saturated are boiled in water (balsam sinking to the bottom) and afterwards squeezed in rope bags; fresh rags replace the saturated ones so long as the dry season lasts and balsam exudes. The following year alternating untouched strips are similarly treated; the third year the first year's spaces are again used, etc. When trees are tapped for six consecutive seasons, a rest of two to three years is generally allowed, which renders the product more abundant and satisfactory, and a rest of five or six years in every twenty assures a continuous yield. It is then put into calabashes or bladders, sent to towns, where it is purified by subsidence, straining, etc. Each tree yields about two lbs. (1 Kg.) annually. In addition to this balsam the fruit by expression yields a white, semi-fluid balsam (*Balsamo blanco*), which somewhat resembles Tolu Balsam, but is an entirely distinct substance;

FIG. 191.



Toluifera Pereiræ.

having an aromatic odor approximating Tonka, yet unlike either balsams of Tolu or Peru; contains a crystalline resin *myroxocarpin*. The tree also exudes a gum-resin which contains 77.4 p. c. resin, but no aromatic principle or cinnamic acid. The natives prepare a tincture from the fruit with rum, called *balsamito;* it is a stimulant, anthelmintic, diuretic and used externally for indolent ulcers, freckles, etc. Balsam of Peru is exported from Acajutla (Pacific coast) and Balize (Atlantic coast) in jars, tin canisters, or metallic drums.

CONSTITUENTS.—Cinnamein 60–65 p. c., Resin 25–32 p. c., Cinnamic and Benzoic acids, benzalcohol, $C_6H_5CH_2(OH)$, stilbene, $C_{14}H_{12}$, styrol, C_8H_8, styracin (cinnamyl cinnamate), $C_9H_7(C_9H_9)O_2$, vanillin.

Cinnamein.—Consists of benzylic benzoate, $C_7H_5(C_7H_7)O_2$, and (little) benzylic cinnamate, $C_9H_7(C_7H_7)O_2$, and separates upon shaking balsam with potassa or soda; it is a colorless, aromatic volatile oil, sometimes known as Peru balsam oil; this oily substance when subjected to dry or fractional distillation yields benzyl alcohol at 200° C. (392° F.), benzylic benzoate at 304° C. (579° F.) and benzylic cinnamate at 357° C. (675° F.), all being colorless, aromatic oils. After complete saponification with potassa, it yields benzalcohol 20 p. c., and cinnamic acid 40 p. c.

Resin.—Consists of peru-resinotannol combined with benzoic and cinnamic acid; insoluble in carbon disulphide; on dry distillation yields benzoic acid, styrol and toluol, C_7H_8.

PREPARATIONS.—(Unoff.) *Syrup. Mistura Oleoso Balsamica* (nervine). *Emulsion. Alcoholic Solution. Ointment. Capsules.*

PROPERTIES.—Stimulant, expectorant, disinfectant, vulnerary, stomachic. It is eliminated by bronchial mucous membrane, kidneys and skin, stimulating and disinfecting their secretions.

USES.—Chronic catarrh, asthma, phthisis, gonorrhœa, amenorrhœa, rheumatism, palsy; externally on indolent ulcers, scabies, ringworm, tonsular diphtheria, bronchitis, tuberculosis of the skin, bone, or larynx, chilblains, eczema, for disguising the odor of iodoform in ointment.

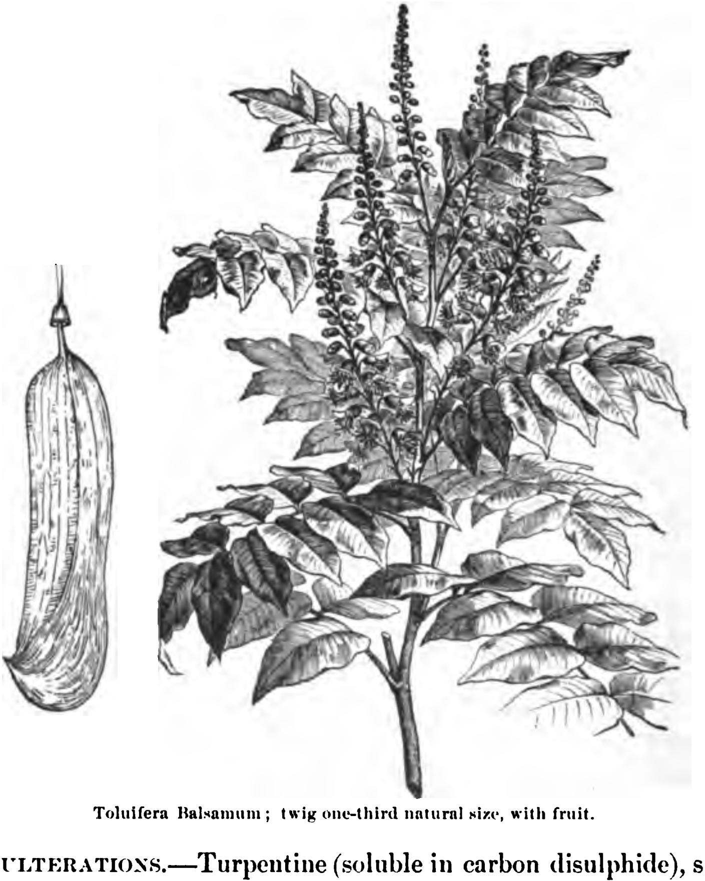
BALSAMUM TOLUTANUM. BALSAM OF TOLU.

Toluifera
Balsamum, *Linné.* } A balsam.

Habitat. S. America, high rolling countries. (Venezuela, Colombia, Peru.)
Syn. Fr. Baume (de Carthagenè) de Tolu. Ger. Tolubalsam.
Bal'sa-mum. L. for balsam, name of balsam tree, from its characteristic secretion. Gr. βάλσαμον.

PLANT.—Evergreen tree 24 M. (80°) high, often branchless for 15 M. (50°) above ground, spreading head; bark smooth, yellowish-brown, with numerous white lenticels, differs from *T. Pereiræ* in having leaves shorter, leaflets smaller, fewer, 4–7, recurved, margin not puckered, nor rachis or petioles hairy, glands less prominent, flowers and fruit similar. BALSAM (of Tolu), a pathologic product, semifluid or solid, yellowish-brown, brittle in cold, transparent in thin layers, microscope yields cinnamic acid crystals; acrid, soluble in alcohol, chloroform, ether, potassa solution; insoluble in water, benzin, carbon disulphide; this latter, when hot, removes only cinnamic and benzoic acids, which solution upon evaporation should leave no resinous substance; odor vanilla-like; taste mild, aromatic. *Test:* The extract with carbon disulphide and sulphuric acid turns rose-red, but if contaminated, brown. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 192.



Toluifera Balsamum; twig one-third natural size, with fruit.

ADULTERATIONS.—Turpentine (soluble in carbon disulphide), sweet gum (yields to hot benzin styracin, crystallizing when cold), storax, various other resins. A factitious balsam has been found containing storax 63 p. c.

Commercial.—The collection is effected by making V-shaped incisions through the bark; below each the wood is hollowed out to receive a calabash cup the size of a teacup, into which the balsam flows. So many as 20–30 incisions are often cut which extend from ground upward 2.5–3 M. (8–10°), the higher ones being made on ladders or scaffolds. As occasion demands, gatherers empty the cups into rawhide, flask-shaped bags (carried by donkeys) which, when filled, are sent to ports along the Magdalena and Orinoco Rivers, in Venezuela; there it is transferred into cylindrical tins (10–25 lbs.; 4.5–11.5 Kg.), formerly calabashes or baked earthen jars, and as such enters commerce via Carthagena. The bleeding continues July to April at the rate of filling the cups during "each moon."

CONSTITUENTS.—Resin, Cinnamic and Benzoic acids, Volatile oil 1 p. c., benzylic cinnamate, benzylic benzoate and vanillin .05 p. c., the three forming an acid, aromatic oily liquid 7.5 p. c.

Resin.—Chief constituent, and consists of tolu-resinotannol combined with benzoic and cinnamic acid; it is amorphous, black, brittle, similar to that of *T. Pereiræ*, having a portion sparingly, while another readily soluble in alcohol.

Volatile Oil.—Obtained by distilling with water; chiefly tolene, $C_{10}H_{16}$, hardening by exposure, odor pleasant, sp. gr. 0.858.

Acids.—Obtained by distillation—benzoic, cinnamic with benzylic ethers of both, the benzyl cinnamate predominating. Trommsdorf found resin 88 p. c., volatile oil 0.2 p. c., cinnamic acid 12 p. c., this latter to come over as a heavy oil condensing into white crystalline mass. Dry distillation gives the above acids and ethers, also styrol, phenol, toluol—this latter being found in coal tar, wood tar, organic compounds, balsams (Peru, etc.) and resins; it is colorless, oily liquid, readily convertible into benzoic acid.

PREPARATIONS.—1. *Syrupus Tolutanus.* Syrup of Tolu. (Syn., Fr. Sirop (balsamique)—de Baume de Tolu; Ger. Tolubalsamsirup.)

Manufacture: 1 p. c. Dissolve 1 Gm. in alcohol 5 Cc., triturate this with precipitated calcium phosphate 5 Gm., sugar 15, water 50 Cc., filter, add sugar 70 Gm., water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

2. *Tinctura Tolutana.* Tincture of Tolu. (Syn., Fr. Teinture de Baume de Tolu; Ger. Tolubalsamtinktur.)

Manufacture: 10 p. c. Macerate 10 Gm. with alcohol q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

3. *Tinctura Benzoini Composita,* 4 p. c. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Emulsion, Lozenges, Inhalations.

PROPERTIES.—Stimulant, expectorant, disinfectant, vulnerary, stomachic.

USES.—Much less decided than balsam of Peru, but similar, bronchial affections, diphtheritic deposits, catarrhs, coughs, flavoring, perfumery.

Incompatibles: Water and aqueous preparations with the tincture.

Synergists: Balsams, aromatic drugs, volatile oils, stimulant expectorants.

Allied Plants:

1. *Myro'xylon puncta'tum.*—The *Quino-quino* tree, and *M. perui'ferum,* both of Peru; yield balsams resembling official Peru and Tolu.

TRAGACANTHA. TRAGACANTH.

Astragalus gummifer, *Labillardière,* and other species. } A gummy exudation.

Habitat. W. Asia.

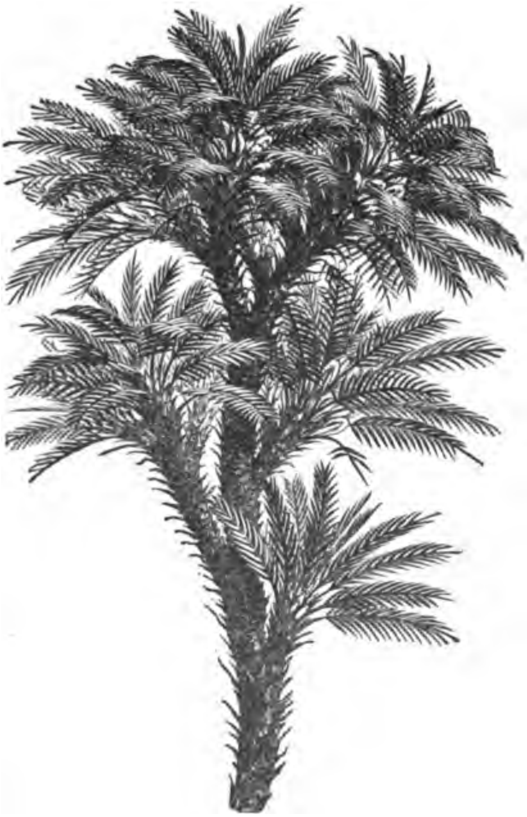
Syn. Goat's Thorn, Doctor's or Hog Gum. Fr. Gomme Adragant(e). Ger. Traganth.

As-trag′a-lus. L. fr. Gr. *ὀστέον*, bone, + *γάλα*, milk ; *i. e.*, the milky then horny exudation, or from the seed squeezed into a squarish form like vertebræ (*αστράγαλος*) in some species.

Gum′mif-er. L. *gummi*, gum, + *ferre*, to bear ; *i. e.*, plant produces gum.

Trag-a-can′tha. L. fr. Gr. *τράγος*, a goat, + *ἄκανθα*, thorn—a goat thorn ; *i. e.*, plant thorny like goat's head, and hedges made of it resist their onslaughts.

Fig. 193.



Astragalus gummifer (natural size of branch).

Plant.—Shrub .6–1 M. (2–3°) high ; stem naked with many straggling, much ramified branches ; bark reddish-gray, rough, and marked with leaf-scars, young twigs woolly ; leaves 3 Cm. (1¼′) long, closely placed, pinnate, rachis hard, stiff, persistent for some years as a woody spine, yellow, very sharp-pointed ; leaflets 10–15 pairs, 3 Mm. (⅛′) long, obovate, grayish-green ; flowers small, pale-yellow ; stamens 10, upper one free, others united in a sheath ; fruit small, oblong pod, covered with white hairs ; seed 1, reniform, smooth, pale-brown. Gum (tragacanth), in narrow or broad bands, curved or contorted, marked by parallel wavy lines or ridges, white or yellowish, translucent, horn-like, tough, powdered more easily by a heat of 50° C. (122° F.), fracture short ; inodorous, insipid, sometimes faintly bitterish. *Tests :* Swells with water, forming a gelatinous mass (tinged blue with iodine T. S.) and a fluid portion (precipitated with alcohol and lead acetate, but not changed by ferric chloride and borax), insoluble in alcohol. *Solvents:* hot or cold water best. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—1. *Cherry Gum* (cherry, almond, plum, etc.), in irregular brownish nodules, insoluble portion not identical with bassorin. 2. *Bassora* or *Kutera Gum.* Persia. This is broken up in Smyrna and mixed with tragacanth; occurs in yellowish-brown (sometimes whitened with lead carbonate), tasteless masses, swelling with water. 3. *Cashew Gum,* brownish-yellow, translucent, iridescent, partly soluble in water.

Commercial.—The many *Astragalus* species are native of mountainous districts of Asia Minor, Armenia, Kurdistan, Persia, Syria, Greece. The gum is not a simple plant juice, but the cells of the pith and medullary rays of the stem undergo transformation into this mucilaginous mass—degenerative product. It exudes spontaneously either through natural or artificial punctures, transverse incisions, etc., produced into stem and older branches. The incisions are made July–August near the ground, and their shape, together with the rate of flow, determines its hardened outline, while time elapsing before sufficiently hard for collection (dry weather 3–4 days) governs its color; white if congealed rapidly, yellow to brown if slowly, due to long exposure to changeable weather—the whiter and more translucent always being of greatest value. Enters commerce via Smyrna (Constantinople, Bagdad and the Persian Gulf), where it is garbled into three varieties.

1. *Flake Tragacanth* or *Leaf Gum.*—Sometimes called Smyrna; usually in broad, thick and yellowish flakes, prominently ridged; the ribbon-like and white flakes are produced in Kurdistan and Persia, often being designated as Syrian tragacanth.

2. *Vermiform Tragacanth* or *Vermicelli.*—In very narrow, contorted string-like pieces or coils, these latter being mostly confluent.

3. *Common Tragacanth* or *Sorts.*—Known in Europe as *traganton,* results from spontaneous exudation, being incidentally collected while gathering higher grades; occurs in tear-like pieces, rounded or irregular, brownish, waxy, and, like the preceding varieties, encloses starch.

CONSTITUENTS.—Traganthin 30 p. c., Calcium Compound of a Gummic Acid 50 p. c., starch, cell fragments, moisture 14 p. c., ash 3 p. c., one-half of which is calcium carbonate.

Traganthin (*bassorin, adraganthin*), $C_6H_{10}O_5$.—A pectin-like principle; swells into a gelatinoid mass with but is insoluble in water, soluble in diluted nitric and hydrochloric acids or ammonia water.

Calcium Compound.—This is combined with gummic acid; was formerly considered *arabin* or *arabic acid;* but the two are not identical, as this compound precipitates with neutral lead acetate and arabin does not; both are precipitated by alcohol or ammonium oxalate.

PREPARATIONS.—1. *Mucilago Tragacanthæ.* Mucilage of Tragacanth. (Syn., Fr. Mucilage Adragant; Ger. Traganthschleim.)

Manufacture: 6 p. c. Heat glycerin 18 Gm. + water 75 Cm., add tragacanth 6 Gm., macerate 24 hours, add water q. s. 100 Gm. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Demulcent, emollient, protective, nutritious.

USES.—Was not known to the Greeks until 4th–5th century, when its uses were as now, for cough, hoarseness, expectorant, similarly as acacia; its superior adhesiveness over the latter renders it a better protective in excoriated surfaces, ulcers, burns, etc. Employed largely for suspending resins, oils, heavy powders, etc., in emulsion. Also to cohere pills, troches, etc.; its partial insolubility in the stomach restricts somewhat its use.

Allied Plants:

1. *Astra'galus bae'ticus.*—Mediterranean basin; seeds used for coffee. *A. exsca'pus.* C. and S. Europe, mountains; root mucilaginous, astringent, bitter, diuretic. *A. glycyphy'llos.* Europe; leaves and seed sweetish, diuretic.

2. *A. crotala'riæ, Loco Weed, Rattle Weed,* and *A. moll'issimus.*—N. America (Cal., Neb., Tex.); poisonous to cattle, horses, etc., causing spinal tetanic action.

SANTALUM RUBRUM. RED SAUNDERS.

Pterocarpus santalinus, *Linné filius.* } The wood.

Habitat. Madras. Cultivated in S. India, Ceylon, Philippines.

Syn. Br. Pterocarpi Lignum, Red Sandal Wood, Chandam, Chundana, Ruby Wood. Fr. Santal Rouge. Ger. Rothes Santelholz.

Pter-o-car'pus. L. fr. Gr. *πτερόν*, wing, + *καρπός*, fruit; *i. e.*, its winged fruit pods or legumes girded with a broad crisped wing.

San-ta-li'nus. L. adj. form fr. *sandal*, Pers. *sandal*, useful. Gr. *σάνταλον*.

San'ta-lum. L. noun form; sandalwood, saunders.

Ru'brum. L. *ruber*, red, ruddy; *i. e.*, the color of the wood.

PLANT.—Tree 6–9 M. (20–30°) high, .3–.5 M. (12–18′) thick, some trunks hollow; leaves trifoliate; leaflets broadly oval, emarginate, 5–15 Cm. (2–6′) long, hoary beneath; flowers yellow, papilionaceous corolla, spikes; fruit orbicular legume, wing slightly crisped, 2-seeded. WOOD, in billets, logs 1–1.6 M. (3–5°) long, 10–20 Cm. (4–8′) thick, deprived of light-colored sapwood, hard, heavy, dark-reddish-brown, splitting coarse splintery; usually met with in chips, or coarse, irregular brownish-red powder; nearly inodorous and tasteless; does not redden water upon maceration. *Solvents:* alcohol; ether; acetic acid; alkaline solutions; boiling water and diluted alcohol partially.

CONSTITUENTS.—Santalin, Santal, Pterocarpin, Homopterocarpin.

Santalin (*santalic acid*), $C_{15}H_{14}O_5$.—Coloring matter, obtained by precipitating alcoholic tincture with lead acetate; wash precipitate with hot alcohol, decompose it with hydrogen sulphide in the presence of alcohol, evaporate, getting red needles, inodorous, tasteless, resinous; soluble in alcohol with a blood-red color, in ether with a yellow, and in alkalies with a violet.

Santal, $C_8H_6O_3$, **Pterocarpin,** $C_{20}H_{16}O_6$, **Homopterocarpin,**

$C_{24}H_{24}O_6$.—All occur in colorless scales; the latter is soluble in carbon disulphide and when fused with potassa yields phloroglucin.

USES.—Red Saunders has no medicinal properties, only being used for imparting color. Employed natively as an astringent and with sapan wood for dyeing silk, cotton, wool, giving various colored reds according to mordants used.

Allied Plant:

1. *Ichthyome'thia Pisci'pula* (*Pisci'dia Erythri'na*), *Jamaica Dogwood.*—W. Indies. Well developed tree, whose bark has long been used for catching fish, orange-yellow, fissured, tough, fibrous, odor opium-like, taste bitter, acrid. Narcotic, analgesic, soporific; neuralgia, nervous insomnia, whooping-cough, dysmenorrhœa; similar to opium, but devoid of unpleasant after-effects. Dose, ʒss–1 (2–4 Gm.), extract, fluid extract.

KINO. KINO.

Pterocarpus Marsupium, *Roxburgh.* } The inspissated juice.

Habitat. E. Indies in forests. C. and S. India, Ceylon, Bengal.

Syn. Gummi or Resina Kino. Vengay. Bastard Teak. Fr. Kino de l'Inde. Ger. Kino.

Mar-su'pi-um. L. *marsupium*, a pouch, bag, purse; *i. e.*, shape of the fruit.

Ki'no. E. India name as given the extract.

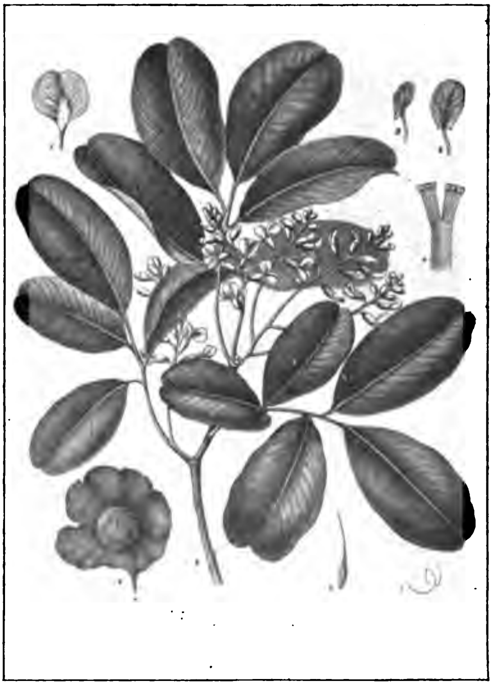
PLANT.—Fine timber tree, called natively *Buja*, 18–24 M. (60–80°) high, .6–1 M. (2–3°) thick, many spreading branches; bark brownish-gray, internally red and fibrous; leaves alternate, imparipinnate, deciduous; leaflets 5–7, alternate, 5–10 Cm. (2–4') long, obovate, emarginate, coriaceous; flowers May–June, pale-yellow; fruit an indehiscent pod, orbicular, 2.5–4 Cm. (1–1½') in diameter; seed 1, kidney-shaped. JUICE (kino), in small angular, dark-brownish-red pieces, brittle, in thin layers ruby-red, transparent, non-crystalline, powder reddish; inodorous, astringent, sweetish, tinging the saliva blood-red, adhering to the teeth; insoluble in ether; the hot water and diluted alcohol solutions gelatinize. *Solvents:* alcohol to the extent of 90 p. c.; alkalies (with impairment of astringency); cold water slightly; boiling water dissolves 80 p. c. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Inferior juices, catechu, etc.

Commercial.—Juice is obtained by cutting a perpendicular incision into the tree-trunk, then lateral ones leading into this, whereupon it exudes, resembling currant-jelly, being caught in vessels placed at the bottom of main incision; it is then dried in the sun and air (inspissated), broken into small fragments, and packed in wooden boxes for market. Its most permanent menstruum is water 20, alcohol 65, glycerin 15 volumes, although alcohol 50, water 25, glycerin 25 gives satisfaction. As all liquid preparations tend to gelatinize and lose astringency they should be kept in small bottles and seldom opened. We have several varieties. 1. *Malabar, E. India.* Official kind described above, but rarely found on the market. 2. *African, Gambia* (*P. erina'ceus*), similar to above, but not now in market. 3. *Ben-*

gal, *Palas* (*Bu'tea frondo'sa*), blackish-red, in transparent, light-ruby-red tears or fragments often with leaf-vein impressions, brittle, not adhesive on mastication; does not contain pyrocatechin but yields it on dry distillation; only one-third or half soluble in hot alcohol, the remainder being mucilaginous matter. 4. *Australian*, *Botany Bay* (*Eucaly'ptus amygdali'na*, *E. resini'fera* and other species, Myrtaceæ), composition and solubility not uniform, as the amount of gum varies in different varieties but furnishes most of our present commercial kino. 5. *W. India*, *Jamaica*, *Caracas* (*Cocco'lobis uvi'fera*, Polygonaceæ). Obtained by boiling the violet-brown wood and bark of the large tree and evaporating the decoction; resembles official, but has brownish tint, less glossy, bitter taste, 90 p. c. soluble in water or alcohol; its tannin almost identical with that in the official.

FIG. 194.



Pterocarpus Marsupium (Kino); A, flowering twig; 1, 2, 3, parts of the flower; 4, stamens; 5, pistil; 6, fruit; 7, vertical section of winged fruit.

CONSTITUENTS.—Kino-tannic acid, $C_{18}H_{18}O_8$, 75 p. c., Kino-red, $C_{28}H_{22}O_{11}$, Pyrocatechin (pyrocatechuic acid, catechol), $C_6H_6O_2$, Kinoin, $C_{14}H_{12}O_6$, gum, ash 1.3 p. c.

Kino-tannic Acid.—Similar to catechuic acid, always mixed with coloring-matter and pectin in extraction; with ferric salts gives a greenish-black and with ferrous salts in neutral solutions a violet color.

Kino-red.—Obtained by exposing cold aqueous solution to the air, when red precipitate slowly forms, hastened by heating ; or heat kinoin to 130° C. (266° F.); it is amorphous, tasteless, nearly insoluble in water, and is the anhydride of kinoin ; $2C_{14}H_{12}O_6 - H_2O = C_{28}H_{22}O_{11}$.

Pyrocatechin.—Obtained by treating kino with ether, or the product of dry distillation of kino contains much of it which can be purified by resublimation ; soluble in ether, water.

Kinoin.—Boil kino with dilute hydrochloric acid, kino-red immediately separates ; now agitate clear solution with ether ; occurs in white crystals, slightly soluble in ether, cold water ; red with ferric chloride.

PREPARATIONS.—1. *Tinctura Kino.* Tincture of Kino. (Syn., Fr. Teinture de Kino ; Ger. Kinotinktur.)

Manufacture: 10 p. c. Macerate 10 Gm. in glycerin 15 Cc., water 20, alcohol 65, for 24 hours, filter, adding alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Infusion, 5 p. c. Dose, ℥ss–1 (15–30 Cc.). *Pulv. Kino Comp.,* 75 p. c. (+ opium 5, cinnamon 20). Dose, gr. 5–20 (.3–1.3 Gm.). *Pulv. Catechu Comp.,* 20 p. c. (catechu 40, krameria 20, cinnamon 10, nutmeg 10). *Fluid Extract.* Dose, ♏v–30 (.3–2 Cc.). *Gargles.*

Owing to gum (pectin) coagulating, the liquid preparations are very uncertain ; therefore catechu is often used in its stead with equally good results.

PROPERTIES.—Astringent, tonic, hæmostatic ; similar to but less powerful than tannin. Locally inferior to other astringents.

USES.—Diarrhœa, pyrosis, menorrhagia, dysentery, leucorrhœa, ulcers, sore throat, manufacture of wines. Useful in dyeing and tanning, but most too expensive.

Incompatibles: Aqueous solution is precipitated by gelatin, soluble salts of iron, silver, lead, antimony, mercuric chloride, sulphuric, nitric and hydrochloric acids.

GLYCYRRHIZA. GLYCYRRHIZA (LIQUORICE ROOT).

Glycyrrhiza glabra, *Linné.*
Glycyrrhiza glandulifera, *Waldstein et Kittaibel.* } The root.
(**G. glabra,** var. **glandulifera,** *Regel et Herder.*)

Habitat. S. Europe, W. Asia, Syria, Persia, N. Africa. (Cultivated in Russia, Spain, England, France, Germany, United States, China.)

Syn. Sweet Wood, Italian Juice Root, or Wood, Spanish Juice Root, Radix Glycyrrhizæ Hispanicæ. Fr. Bois doux, Racine douce, Bois de Réglisse. Ger. Radix Liquiritiæ, Spanishes Süssholz.

Glyc-yr-rhi′za. L. fr. Gr. *γλυκύρριζα—γλυκός*, sweet, + *ρίζα*, root ; *i. e.*, its saccharine taste (Dioscorides).

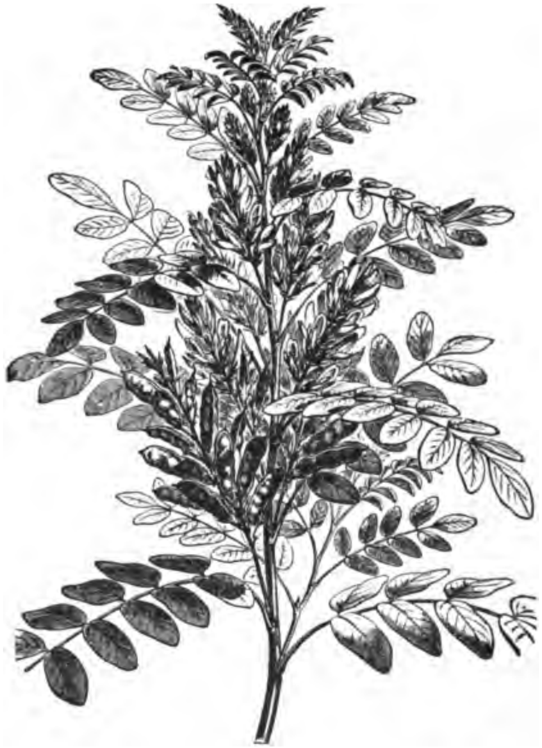
Gla′bra. L. *glaber*, smooth, hairless ; *i. e.*, leaves smooth on both sides.

Glan-du-lif′e-ra. L. *glandula*, a gland, + *ferre*, to bear ; *i. e.*, pods covered with thick glandular spines.

Liq′uo-rice—Lic′o-rice (lik′o-ris). Fr. L. *liquiritia*, corrupt. of *glycyrrhiza.*

PLANT.—Perennial herb ; stem .6–1.5 M. (2–5°) high, several from the (crown) thick rhizome ; leaves imparipinnate ; leaflets 4–7 pairs, ovate, entire, smooth, glutinous beneath, dark-green; flowers purple, pulse-shape, racemes; fruit legume, 2.5 Cm. (1′) long, brown, ovate, flat, 1-celled, 1–6-(kidney-shape) seeded; *G. glandulifera*—stem somewhat pubescent; leaves hairy, glandular beneath; legumes glandular, prickly. ROOT, long, cylindrical, in stores 15–30 Cm. (6–12′) long, 5–25 Mm. ($\frac{1}{5}$–1′) thick, straight, longitudinally wrinkled, grayish-brown, warty, internally tawny-yellow, pliable, tough, fracture coarsely fibrous, bark thickish, 4 Mm. ($\frac{1}{6}$′), wood porous, dense, in narrow wedges, medullary rays linear; taste sweet, acrid; *G. glandulifera*—15–45 Cm. (6–18′) long, 1–4 Cm. ($\frac{1}{3}$–1$\frac{1}{2}$′) thick, often without corky layer; wood soft, somewhat cleft, sweet, feebly bitter. *Solvents:* water; diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

FIG. 195.



Glycyrrhiza glabra.

Commercial.—We have two varieties:

1. *Spanish* (*Italian, Turkish, Alicante, Tortosa*); *G. glabra.*—This is the sweeter and the kind most generally used.

2. *Russian; G. glandulifera.*—This is thicker, somewhat bitter. Roots of both are dug, washed, trimmed, assorted, cut into suitable lengths, dried, and marketed in bundles, bales, or bags; the former is

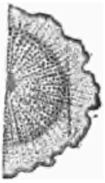
usually *unpeeled*, the latter, consisting of roots and root branches, is mostly *peeled*. It not only grows wild and under cultivation in Russia, but also in Turkey and Hungary, being imported via Hamburg. The English root is sometimes met with, both dried and fresh, mostly in pieces several feet long.

ADULTERATIONS.—The one variety of the root with the other, as they are often collected together; also the underground stem, which resembles the root, but has a thin central pith.

CONSTITUENTS.—Glycyrrhizin, $C_{44}H_{63}NO_{18}$, 6 p. c., Glycyramarin, $C_{36}H_{57}NO_{13}$, sugar, asparagin 3 p. c., starch, resin.

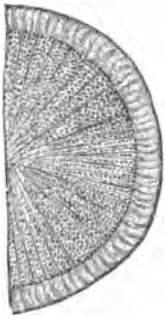
Glycyrrhizin.—This is combined with ammonia, being called glycyrrhizate of ammonium or glycyrrhizic acid. It is a tribasic acid (glucoside) obtained from cold infusion by coagulating albumin with heat, filtering, precipitating with sulphuric acid, washing precipitate with water, dissolving same in alcohol to which a little ether has been added (or in very weak ammonia water, 1 to 10), filtering, evaporating. It is very soluble in water, sparingly in alcohol, ether; when boiled with diluted sulphuric acid (by hydrolysis) splits into parasaccharic acid (glucose), $C_6H_{10}O_8$, and bitter resinous glycyrrhetin, $C_{32}H_{47}NO_4$.

FIG. 196.



Glycyrrhiza glabra (rhizome), natural size.

FIG. 197.



Glycyrrhiza glandulifera (root).

PREPARATIONS.—1. *Extractum Glycyrrhizæ.* Extract of Glycyrrhiza. (Syn., Extract of Liquorice, Extractum Liquiritiæ, Liquorice; Fr. Suc (jus) de réglisse, Sucre noir; Ger. Lakriz, Lakrizensaft, Succus Liquiritiæ.)

Manufacture: Evaporate decoction to proper consistence, powder or mould into sticks 12.5–17.5 Cm. (5–7′) long, 12–25 Mm. (½–1′) thick; has glossy-black color, fracture sharp, conchoidal, shining, peculiar sweet taste. At least 60 p. c. should be soluble in cold water. Dose, *ad libitum.*

Preps.: 1. *Trochisci Glycyrrhizæ et Opii.* Troches of Glycyrrhiza and Opium. (Syn., Br. Trochisci Opii, Opium Lozenges; Fr. Pastilles de Réglisse Opiacées; Ger. Opiumpastillen.)

Manufacture: Extract of liquorice 15 Gm., opium 0.5, acacia 12, sugar 20, anise oil 0.2 Cc., water q. s. 100 troches. Dose, 1 troche occasionally.

2. *Trochisci Ammonii Chloridi*, gr. 4 (.26 Gm.). Dose, 1–2 troches occasionally.

2. *Extractum Glycyrrhizæ Purum.* Pure Extract of Glycyrrhiza. (Syn., Br. Extractum Glycyrrhizæ. Extractum Glycyrrhizæ Depuratum; Succus Liquiritiæ Depuratus; Fr. Extrait de Réglisse (pur); Ger. Süssholz-Extrakt.)

Manufacture: Macerate, percolate glycyrrhiza 100 Gm. with ammonia water 15 Cc. + distilled water 300 Cc., finishing with latter alone q. s. to exhaust, evaporate; yield 16–25 p. c. Dose, *ad libitum.*

Prep.: 1. *Mistura Glycyrrhizæ Composita.* Compound Mixture of Glycyrrhiza. (Syn., Brown Mixture; Fr. Mixture de Réglisse; Ger. Lakritzen-Mixtur.)

Manufacture: Pure extract of liquorice 3 Gm., syrup 5 Cc., mucilage of acacia 10, camphorated tincture of opium 12, wine of antimony 6, spirit of nitrous ether 3, water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

3. *Extractum Glycyrrhizæ Fluidum.* Fluid Extract of Glycyrrhiza. (Syn., Br. Extractum Glycyrrhizæ Liquidum; Fr. Extrait liquide de Réglisse; Ger. Flüssiges Süssholz-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with ammonia water 5 Cc., alcohol 30 p. c. 95 Cc., finishing with latter alone q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Prep.: 1. *Syrupus Sarsaparillæ Compositus*, 1.5 p. c. Dose, ʒj–4 (4–15 Cc.).

4. *Glycyrrhizinum Ammoniatum.* Ammoniated Glycyrrhizin. (Syn., Fr. Glycyrrhizine Ammoniacale; Ger. Ammoniak Glycyrrhizin.)

Manufacture: Macerate, percolate glycyrrhiza 100 Gm., with ammonia water 5 Cc. + water 95, then with water alone q. s. 100 Cc., precipitate with q. s. sulphuric acid, wash, redissolve in diluted ammonia water, again precipitate with q. s. sulphuric acid, wash, dissolve in diluted ammonia water and spread on glass to dry. It is in brownish-red scales, odorless, very sweet, readily soluble in water and alcohol; adding an acid to aqueous solution precipitates glycyrrhizin. Dose, gr. 5–15 (.3–1 Gm.).

5. *Pulvis Glycyrrhizæ Compositus.* Compound Powder of Glycyrrhiza. (Syn., Fr. Poudre pectorale de Réglisse composée; Ger. Pulvis (Liquiritiæ Compositus) Pectoralis Kurellæ, Brustpulver.)

Manufacture: Glycyrrhiza 23.6 Gm., senna 18, washed sulphur 8, fennel oil 0.4, sugar 50. Dose, ʒss–2 (2–8 Gm.).

6. *Decoctum Sarsaparillæ Compositum*, 2 p. c. Dose, ℥j–4 (30–120 Cc.).

7. *Extractum Sarsaparillæ Fluidum Compositum*, 12 p. c. Dose, ʒss–1 (2–4 Cc.).

8. *Massa Hydrargyri*, 5 p. c. Dose, gr. 1–15 (.06–1 Gm.).

9. *Pilulæ Ferri Iodidi*, gr. .6 (.04 Gm.). Dose, 1–2 pills.

10. *Pulvis Morphinæ Compositus*, 33.3 p. c. Dose, gr. 5–15 (.3–1 Gm.).

11. *Tinctura Aloes*, 20 p. c. Dose, ʒss–2 (2–8 Cc.).

12. *Tinctura Aloes et Myrrhæ*, 10 p. c. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Syrup.—Macerate root 20 parts in water 100 + ammonia water 10, for 12 hours, boil, filter, evaporate to 10, add alcohol 10, let stand 12 hours, filter, add syrup q. s. 100 parts. Or can make from fluid extract 2 + syrup 8 parts. Dose, *ad libitum*, mostly for flavoring.

PROPERTIES.—Demulcent, expectorant, laxative; locally slight stimulant. Increases, when chewed, the flow of saliva and mucus, which secretions are emollient to the throat.

USES.—Febrile catarrhal affections, bronchitis, bowel and urinary trouble; here should be prepared with flaxseed, rice, barley, or gum water. In pharmacy used to cover taste of aloes, ammonium chloride, bitter sulphates, colocynth, guaiacum, hyoscyamus, mezereum, senega, senna, quinine, turpentine, etc. Mechanically as an excipient and dryer in pills, troches, etc.

Allied Plants:

1. *G. echina'ta.*—Europe, Hungary, S. Russia; flowers in globular heads, pod ovoid with long spines. *G. lepido'ta.* United States (Mo., Minn.).

2. *A'brus precato'rius, Indian* or *Wild Liquorice, Jequirity.*—India, Brazil. Seeds used as standard weight, and for criminal poisoning, although inert when taken whole; contain *abrin*, having the action of snake-venom, being cardiac depressant. Root contains glycyrrhizin, and becomes a poor substitute for liquorice.

3. *Ono'nis spino'sa, Rest-harrow.*—Europe. Root .6 M. (2°) long, 12 Mm. (½′) thick; odor and taste similar to official liquorice.

4. *Gly'cine (So'ja) hi'spida, Soja Bean.*—Japan; cultivated S. Asia. Contains casein 40 p. c., fat 18, dextrin 10, starch 5, cellulose 5, water 10, amylolytic ferment. Owing to the beans having so little starch they are ground into flour, and this made into bread for diabetic patients, in order to reduce sugar in the urine.

SCOPARIUS. SCOPARIUS (BROOM).

Cytisus
scoparius, (*Linné*) *Link.* } The tops.

Habitat. W. Asia, S. and W. Europe (W. Siberia, Great Britain), sandy soil. Naturalized in middle and southern United States. Cultivated in gardens.

Syn. Common or Irish Broom. Br. Scoparii Cacumina. Fr. Genêt à balais. Ger. Besenginster, Pfriemenkraut.

Cyt'i-sus. L. fr. Gr. *κύτισος*, classic name after Island Cythrus, one of the Cyclades; *i. e.*, where first found growing.

Sco-pa'ri-us. L. fr. *scopæ*, twigs, shoots, a broom; *i. e.*, made of twigs, twiggy.

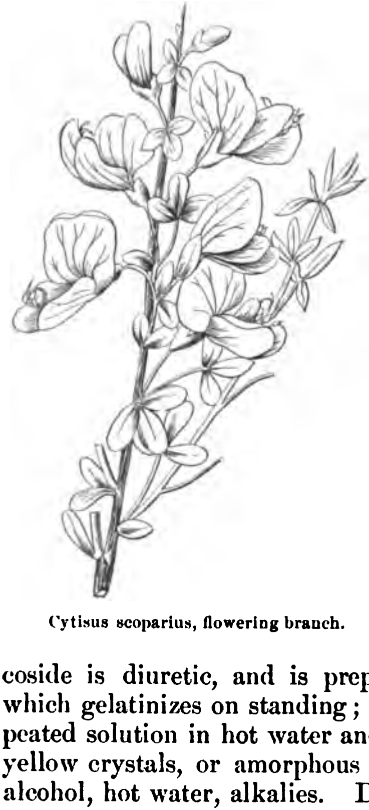
PLANT.—Shrub 1.2–2.4 M. (4–8°) high; stem 2.5–5 Cm. (1–2′) thick, with many pentangular, green, flexible, wand-like branches; leaves alternate, small, oblong, downy, trifoliate; leaflets sessile, 6–12 Mm. (¼–½′) long, lanceolate; flowers May–June, many, large, racemes, brilliant-yellow, papilionaceous; fruit pod, 4 Cm. (1½′) long, 6 Mm. (¼′) wide, compressed 12–18-seeded, entire plant with nauseous taste;

peculiar odor. TOPS, in thin flexible branched twigs, pentangular, winged, dark-green, nearly smooth, tough, usually free from leaves; odor when bruised peculiar; taste disagreeably bitter. *Solvents:* water; alcohol. Dose, gr. 15–30 (1–2 Gm.).

CONSTITUENTS.—Sparteine, Scoparin, Volatile oil, tannin, fat, wax, sugar, ash 5–6 p. c.

Sparteine, $C_{15}H_{26}N_2$.—This alkaloid is cardiac stimulant, narcotic, and is obtained by distilling mother-waters of scoparin, or by exhausting plant with acidulated (H_2SO_4) water, distilling concentrated liquid with soda. It is a colorless, oily liquid, brown upon exposure, aniline odor, bitter, soluble in alcohol, ether, chloroform; yield ʒj (4 Cc.) from 25 lbs. (11 Kg.) of plant; forms salts (hydrochlorate, hydroiodate, sulphate, etc., all in crystalline form).

FIG. 198.



Cytisus scoparius, flowering branch.

Sparteinæ Sulphas, Sparteine Sulphate, $C_{15}H_{26}N_2H_2SO_4 + 4H_2O$, *official*.—(Syn., Fr. Sulfate de Spartein; Ger. Sparteinsulfat.) Obtained by neutralizing the alkaloid sparteine with sulphuric acid and crystallizing. It is a neutral sulphate, in white prismatic crystals or powder, odorless; saline, bitter taste; absorbs moisture; no residue, soluble in water, alcohol. *Test:* Shake 0.05 Gm. + 5 Cc. potassa or soda T. S. in a test-tube; liquid becomes turbid, and small drops of sparteine gradually collect on the surface; now place a strip of moistened red litmus at the mouth, heat gently; paper turns blue, but no ammoniacal odor (abs. ammonium salts). Dose, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.01–.03 Gm.).

Scoparin, $C_{21}H_{22}O_{10}$.—This glucoside is diuretic, and is prepared from the concentrated decoction which gelatinizes on standing; this jelly is expressed, purified by repeated solution in hot water and finally in hot alcohol. It is in pale-yellow crystals, or amorphous powder, odorless, tasteless, soluble in alcohol, hot water, alkalies. Dose, gr. 1–10 (.06–.6 Gm.).

PREPARATIONS.—1. *Extractum Scoparii Fluidum.* Fluid Extract of Scoparius. (Syn., Fluid Extract of Broom; Fr. Extrait liquide de Genêt à Balais; Ger. Flüssiges Besenginster-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Succus.*

PROPERTIES.—Diuretic, narcotic; large doses, emetic, cathartic, paralyzing respiratory and motor centres; causes tonic convulsions, death by asphyxia; normal doses strengthen heart beats, slow the rate, (acting directly on the cardiac muscle and the inhibitory apparatus), increase cutaneous and renal circulation (flow of urine and excretion of urea); may quicken pulse when abnormally slow, acting as a regulator.

USES.—Cardiac affections, palpitation, asthma, dropsies, chronic Bright's disease, nephritis; inferior to digitalis, although having the advantage of quicker action (within 20 minutes), and no cumulative effect; must not be given in acute kidney troubles. Dropsical sheep are benefited by it, and it is sometimes substituted for hops.

Poisoning: Strychnine, atropine, electricity (respiration), tannin, potassium iodide, diuretics, diluents.

Incompatibles: Tannic acid, potassium iodide.

Synergists: Digitalis, strophanthus, etc.

Allied Plants:

1. *Spa'rtium ju'nceum, Spanish Broom.*—Leaves soft, hairy; seeds reniform, properties like official; fibres used for cordage, coarse cloth, etc.

2. *Bapti'sia tincto'ria, Wild* or *False Indigo.*—The whole plant official, 1830–1840. N. America. Plant .6–1 M. (2–3°) high, smooth, succulent, glaucous; flowers yellow, root most active; has head with knotty branches; plant has disagreeable odor when bruised; taste bitter, acrid, nauseous; contains baptisine (acrid, poisonous), baptisin (bitter glucoside), baptin (purgative glucoside); used as a stimulant for scarlatina, typhus, dysentery; locally—aphthæ, ulcers, etc.; in decoction, infusion. Dose, gr. 5–15 (.3–1 Gm.); baptisin gr. 2–6 (.13–.4 Gm.); large doses, emetic, cathartic.

ARAROBA. GOA POWDER.

Chrysarobinum. Chrysarobin, $C_{30}H_{26}O_7$, *Official.*

Vouacapoua Araroba, (*Aguiar*) *Lyons.* (**Andira Araroba,** *Aguiar.*)	A neutral principle, in its impure commercial form, extracted from Goa Powder, a substance found in this plant's wood.

Habitat. Brazil, Bahia, in damp forests.

Syn. Araroba, Arariba, Po(h)de Bahia. Fr. Poudre de Goa, Chrysarobine. Ger. Goa Pulvre. Chrysarobin.

Vou-a-ca-pou'a. L. fr. native C. American name (nomen caribæum), *voicapou.*

Ar-a-ro'ba. L. fr. E. India name *ar(ar)oba,* as applied to the bark.

An-di'ra. L. reproduction of its Brazilian name.

Chrys-ar-o-bi'num. L. for *Chry-sar'o-bin,* fr. Gr. χρυσός, gold, + *ar(ar)oba.*

Go'a. After Port Colony of Goa, in India into which it was imported from Bahia, in Brazil, 1852.

PLANT.—The *Vouacapoua Araroba* or Po' de Bahia is a large tree 24–30 M. (80–100°) high, closely allied to the W. Indies "Cabbage Tree"; trunk smooth, spheroidal, head not very bushy; leaves paripinnate, with long petioles; flowers purple, paniculate racemes; wood yellow, with numerous longitudinal canals and many irregular transverse interspaces or lacunæ, in which the Goa Powder is found resulting from the decay of trunk wood (medullary rays) which yields much chrysophanic acid by oxidation.

Commercial.—Tree is called natively *Angelim Amargosa;* the oldest yield most powder, which is obtained by felling, splitting the tree and then scraping the powder from the clefts, those doing this often suffering with irritated eyes and face. It is light-yellow when fresh, but brownish by exposure, slightly crystalline, rough, mixed with wood-fibres, inodorous, bitter; 7 p. c. soluble in water, 80 p. c. in benzene, 50 p. c. in hot chloroform.

CONSTITUENTS.—GOA POWDER: Chrysarobin 80–84 p. c., gum 7 p. c., resin 2 p. c., bitter extractive 7 p. c., woody fibre 5 p. c., ash 0.5 p. c.

Chrysarobinum. Chrysarobin.—This is obtained by hot benzene; it is a pale-orange, crystalline powder; odorless, tasteless, brownish by exposure; completely soluble in 150 parts boiling alcohol, 33 boiling benzene, chloroform, ether, alkaline solution; no residue. *Tests:* 1. Dissolves in sulphuric acid with deep-red color, and this poured into water precipitates the substance unchanged; 2. 1 Gm. + 10 Cc. potassa T. S. in a test-tube, upon shaking the solution becomes at first yellow, then yellowish-red, deep-red, from absorbing air thus producing chrysophanic acid; $C_{30}H_{26}O_7 + O_4 = 2C_{15}H_{10}O_4 + 3H_2O$. Chrysarobin gives brown mass with melted potassa, and is nearly insoluble in dilute potassa solution, while chrysophanic acid gives blue mass, and is soluble in dilute potassa solution with red color. Dose, gr. $\frac{1}{8}$ (.008 Gm.).

PREPARATIONS.—1. *Unguentum Chrysarobini.* Chrysarobin Ointment. (Syn., Fr. Pommade de Chrysarobine; Ger. Chrysarobin-salbe.)

Manufacture: 5 p. c. Chrysarobin 5 Gm., benzoinated lard 95.

PROPERTIES.—Irritant, in doses of gr. 20 (1.3 Gm.) gastro-intestinal irritant, causing large watery, bilious stools, vomiting, nausea. Externally, produces diffuse dermatitis, followed by follicular and furuncular inflammation; stains skin dark-brown, removed by chlorinated lime.

USES.—Parasitic skin diseases of vegetable origin, ringworm, acne, fulvus, psoriasis, chronic eczema, hemorrhoids.

Allied Compounds:

1. *Anthrarobin (Desoxyalizarin),* $C_{14}H_{10}O_{13}$.—Obtained from the coal-tar product alizarin by action of nascent hydrogen; it is a strong deoxidizing agent, miscible with fats, weaker, less irritating and toxic than chrysarobin, soluble in alcohol, glycerin.

2. *Hydroxylamine Hydrochloride,* NH_2OHHCl.—This does not stain the skin, hence is often preferred to the other reducing agents (chrysarobin, pyrogallol, anthrarobin, etc.) in skin diseases, but being a poison care must be exercised in not allowing too much to be absorbed by the system.

PHYSOSTIGMA. PHYSOSTIGMA (CALABAR BEAN).

Physostigma venenosum, *Balfour.* } The seed.

Habitat. W. Africa (near mouths of Niger and Old Calabar Rivers, in the Gulf of Guinea. Introduced into India and Brazil).

Syn. Ordeal Bean, Chop Nut, Split Nut. Fr. Fève de Calabar. Ger. Faba Calabarica, Kalabarbohne.

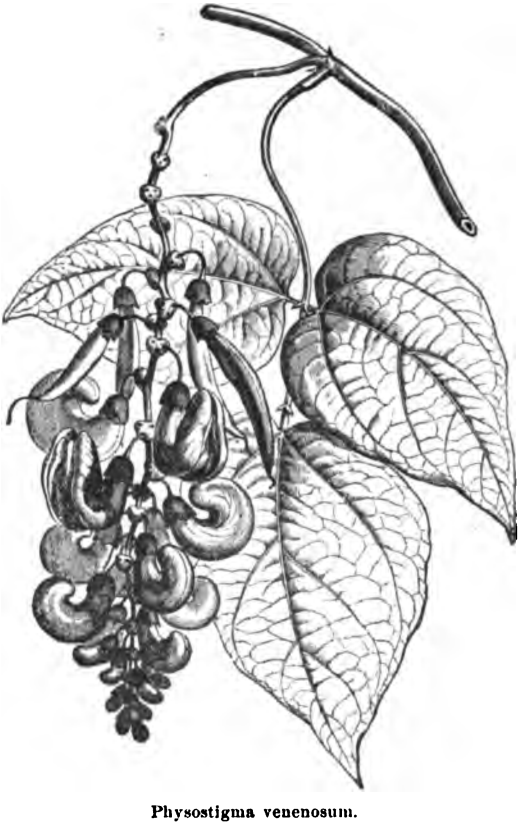
Phy-so-stig′ma. L. fr. Gr. *φύσα*, a bladder,+ *στίγμα*, stigma, stigmatic appendage is hollow and inflated.

Ven-e-no′sum. L. *venenosus*, full of poison, poisonous; *i. e.*, plant's property.

Cal′a-bar Bean; i. e., bean from the Calabar district on W. African coast.

PLANT.—Woody, perennial climber; stem 12–15 M. (40–50°) long, 5 Cm. (2′) thick, smooth, resembles our scarlet runner and Spanish bean (genus *Phase′olus*); root spreading, fibrils many, having attached small succulent tubers; leaves large, pinnately trifoliate; leaflets 7.5–15 Cm. (3–6′) long, stipulate, ovate pointed; flowers purplish, racemes; fruit June–September, pod 10–17.5 Cm. (4–7′) long, compressed, pointed, pale-brown, 2-valved, reticulately veined, dehiscent, inside woolly, 2–3-seeded. SEED, 25 Mm. (1′) long, 15 Mm. (⅝′) broad, 12 Mm. (½′) thick, oblong, reniform, testa granular, a chocolate-brown color, hilum in a broad black groove, extending over entire length of the convex edge, bordered on each side by reddish-brown ridge, embryo with a short, curved radicle, and two large, white, concavo-convex cotyledons; inodorous; taste bean-like. The embryo on moistening with potassa T. S. becomes pale-yellow; embryo 72 p. c., integuments 28 p. c. *Solvent:* alcohol. Dose, gr. 1–4 (.06–.26 Gm.).

FIG. 199.



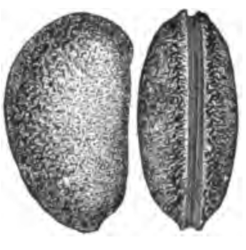
Physostigma venenosum.

ADULTERATIONS.—1. *P. cylindrospe′rmum*, seeds 4 Cm. (1⅝′) long, nearly cylindrical, groove and hilum shorter, not extending quite to the end. 2. *E'ntada sca'ndens*, seed 5 Cm. (2′) long, also *Oil Palm Seeds* and seeds of *Mucuna* species. None of these resembles to any extent the official.

CONSTITUENTS.—Physostigmine (eserine) .1 p. c., Calabarine (eseridine), eseramine (physiologically inactive), phytosterin, starch 48 p. c. proteids (albumin) 23 p. c., mucilage, fat 2.5 p. c., ash 3 p. c.

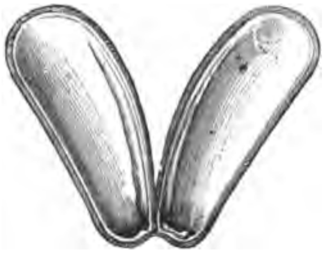
Physostigmine, $C_{15}H_{21}N_3O_2$.—Chiefly in embryo; obtained by mixing powdered bean with 1 p. c. tartaric acid, exhausting with alcohol, evaporating; treat residue with water, agitate filtrate with ether to remove color, add sodium bicarbonate, shake with ether, evaporate, getting colorless, amorphous physostigmine, hygroscopic, tasteless, soluble in alcohol, ether, chloroform, benzene, carbon disulphide, slightly in water; forms salts (benzoate, citrate, hydrobromate, hydrochlorate, nitrate, etc.). With alkalies or chlorinated lime yields red *rubreserine*, with sulphuric acid gives yellow, then olive green. Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

FIG. 200.



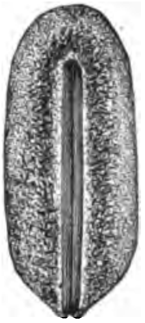
Physostigma; view from the side and edge, showing length of hilum.

FIG. 201.



Physostigma split, showing cotyledons.

FIG. 202.



Physostigma cylindrospermum.

Physostigminæ Salicylas. Physostigmine Salicylate, *official.*—(Syn., Eserine Salicylate; Fr. Salicylate d'Eserine; Ger. Physostigminsalicylat.) Obtained by neutralizing alcoholic solution of the alkaloid with salicylic acid, allowing to crystallize; occurs in faintly yellowish crystals, odorless, bitter, reddish upon exposure, soluble in 150 parts water, 12 alcohol, no residue. *Tests:* 1. With sulphuric acid yellow. 2. With ammonia water yellowish-red color; evaporate, get blue residue which dissolves in alcohol (blue), becoming violet-red and fluorescent with acetic acid. 3. With ferric chloride T. S. get deep-violet color. Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

Physostigminæ Sulphas, Physostigmine Sulphate, *official.*—(Syn., Eserine Sulphate; Fr. Sulphate d'Esérine; Ger. Physostigminsulfat.) Obtained by neutralizing alcoholic solution of the alkaloid with sulphuric acid, allowing to crystallize; occurs in yellowish-white crystals, odorless, bitter, deliquescent, reddening by exposure, soluble in water, alcohol, no residue. *Tests:* With barium chloride T. S. get white precipitate, insoluble in hydrochloric acid. Other tests same as in salicylate. Both salts should be kept in dark-amber, well-stoppered vials. Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

Calabarine, $C_{15}H_{23}N_3O_3$.—Derivative of physostigmine, from which it is distinguished mainly by its insolubility in ether; obtained from its mother-liquor by precipitating with lead subacetate and ammonia, evaporating filtrate; treat residue with alcohol, precipitate with phosphotungstic acid, decompose with baryta. It is tetanic, may cause diarrhœa, soluble in water and alcohol, insoluble in ether, by warm dilute acids converted into physostigmine. Dose, gr. $\frac{1}{20}$–$\frac{1}{10}$ (.003–.006 Gm.).

Phytosterin.—Neutral principle obtained by exhausting beans with benzin; resembles cholesterin, crystalline, but has no rotative power.

PREPARATIONS.—1. *Extractum Physostigmatis.* Extract of Physostigma. (Syn., Fr. Extrait de Fève de Calabar; Ger. Extractum Fabæ Calabaricæ, Kalabarbohnen-Extrakt.)

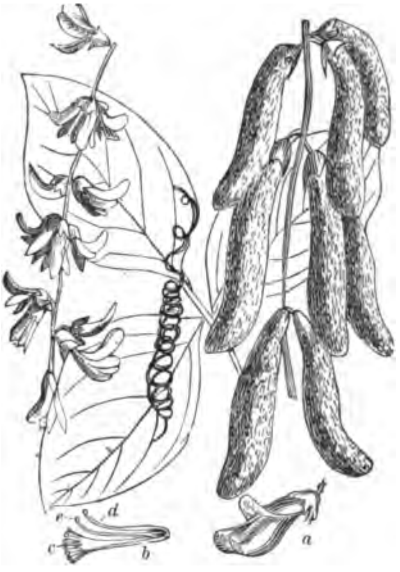
Manufacture: Macerate, percolate 100 Gm. with alcohol. Dose, gr. $\frac{1}{10}$–$\frac{1}{2}$ (.006–.03 Gm.).

2. *Tinctura Physostigmatis.* Tincture of Physostigma. (Syn., Fr. Teinture de Fève de Calabar; Ger. Kalabarbohnentinktur.)

Manufacture: 15 p.c. Macerate, percolate 15 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–20 (.3–1.3 Cc.).

PROPERTIES.—Sedative, myotic, motor depressant, paralyzant, emetic, purgative, diaphoretic, sialagogue, poisonous. Stimulates salivary, gastric and intestinal secretions, peristalsis, acting directly upon the unstriped muscle-fibres, quickens breathing then retards it, heart becomes slow and irregular, but more powerful, finally feeble and ceasing altogether, depresses, ultimately paralyzes spinal cord reflex and motor centres.

FIG. 203.



Mucuna pruriens; *a*, flower; *b*, stamen system; *c*, anthers; *d*, filament; *e*, anther.

When poisoned, have nausea, giddiness, indistinct vision, diminished heart action, muscular tremors and weakness, then complete relaxation, retarded respiration, motor paralysis, sphincters contract, cold extremities, skin covered with cholera-like sweat. Conscious until death, which is caused by carbonic acid narcosis and paralysis of muscles of respiration.

USES.—Tetanus, chorea, epilepsy, progressive paralysis, tonic convulsions, gastralgia, strychnine and atropine poisoning, constipation (combined with belladonna and nux vomica). Externally, in neuralgia, muscular rheumatism, malignant tumors. Physostigmine ($\frac{1}{2}$ p. c. in water, few drops into eye) for breaking up ocular adhesions (iris, cornea, lens), lessen intra-ocular tension, iritis, corneal ulcers, prolapsed iris, paralysis of the iris accommodation following diphtheria, glaucoma. In Africa as *ordeal bean* of Calabar for punishing criminals and for witchcraft, the accused having to eat them until they vomit or die : if former, innocent ; latter, guilty. A paste of 20 seeds will kill.

Poisoning: Evacuate stomach (emetics, pump). Give atropine hypodermically, gr. $\frac{1}{80}$ (.002 Gm.); tannin, chloral hydrate (spine), strychnine, diffusible stimulants, coffee, ammonia, digitalis, alcohol, artificial heat and respiration, electricity. Empty bladder often (catheter) as it is eliminated by kidneys (bile and saliva), and urine becomes posionous.

Incompatibles: Vegetable astringents, tannin, caustic alkalies, atropine, chloral hydrate, motor and tetanizing excitants.

Synergists: Motor depressants, conium, gelsemium, amyl nitrite, etc.

Allied Plant:

1. *Mucu'na pru'riens.*—Hairs of the pods official, 1820–1880. E. and W. Indies. Climbing plant, flowers resemble those of the pea, purple ; leaflets hairy ; pods coriaceous, shape of italic letter *f*, 10 Cm. (4′) long, covered with brown hairs, 2.5 Mm. ($\frac{1}{10}$′) long, stiff, filled with brown granular matter, readily penetrating the skin, causing violent itching. Detached from pods (which then are eaten as also when green in India) by dipping into honey, scraping into paste. Contains resin, tannin. Used as anthelmintic for round worms; irritant in paralysis. Action on worms thought to be mechanical. Dose, gr. 1–3 (.06–.2 Gm.), followed by calomel, jalap. Ointment also used.

43. GERANIACEÆ. Cranesbill or Geranium Family.

Je-ra-ni-a'se-e. L. *Gerani-um* + aceæ, fem. pl. of *geraniaceus*, fr. Gr. γέρανος, a crane; *i. e.*, called cranesbill from resemblance of the long beak of seed capsule. Herbs or shrubs with stipules and swollen joints. Distinguished from Rutaceæ by leaves non-glandular, non-punctate; axis of lobed fruit persistent; carpels distinct, indehiscent; flowers often showy and irregular ; sepals 5 ; petals 5 ; stamens 10 ; ovary lobes as many as sepals with common style, superior ; fruit capsular, seed exalbuminous ; universal ; astringent, aromatic, resinous, perfumery.

Genus : 1. **Geranium.**

GERANIUM. GERANIUM (CRANESBILL).

Geranium maculatum, *Linné.* } The rhizome.

Habitat. N. America—rich woods, thickets (Canada, United States).

Syn. Alum, American Kino or Astringent Root, American Tormentilla, Crowfoot, Spotted or Wild Geranium—Cranesbill—Dovefoot. Fr. Racine de Bec de Grue tacheté, Racine de Pied de Corneille. Ger. Fleckstorchschnabelwurzel.

GERANIACEÆ.

Ge-ra′ni-um. L. see etymology, on page 312, of Geraniaceæ.

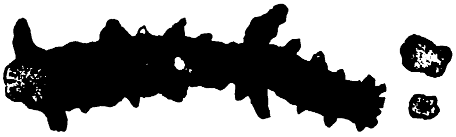
Mac-u-la′tum. L. *maculatus, macula*, spotted, spot; *i. e.*, leaves acquire white spots by age.

Plant.—Perennial herb; stem green, erect, hairy, .3–.6 M. (1–2°) high; leaves palmately 5–7-lobed, each lobe incised at extremity, wedge-shaped, hairy, pale-green with paler spots; flowers April–June, large, 2.5–4 Cm. (1–1½′) wide, purplish, umbels; petals 5, entire, bearded, on claw 12 Mm. (½′) long; fruit long-beaked, with five 1-seeded carpels. Rhizome, horizontal, cylindrical, 5–7.5 Cm. (2–3′) long, 12 Mm. (½′) thick, sharply tuberculated, longitudinally wrinkled, dark-brown; fracture short, reddish-brown, bark thin; wood-wedges yellowish, small, in circle near cambium line, medullary rays broad; central pith large; roots thin, fragile; bark thick, inodorous, astringent. Should be collected in early autumn, washed and dried. Was very popular with our Indians, but now little used. *Solvents:* alcohol; water. Dose, gr. 15–60 (1–4 Gm.).

Adulterations.—1. *Potenti′lla Tormenti′lla.* Europe, N. America, resembles our cinquefoil. 2. *Poly′gonum Bisto′rta.* United States. 3. *Sanguina′ria canade′nsis.* N. America. 4. *Roots of all allied species.*

Constituents. — Tannin 12–27 p. c., Gallic acid, red coloring matter, (starch, pectin, sugar).

Fig. 204.



Geranium maculatum; rhizome and transverse section of rhizome and root, natural size.

Tannin.—Present in largest amount about April; it is analogous to gallo-tannic acid, yields blue-black with ferric salts and pyrogallol on heating.

Gallic Acid.—Mostly in the dry rhizome.

The "Eclectic" resinoid extract, geranin, is made by precipitating the concentrated alcoholic tincture with water.

Preparations.—1. *Extractum Geranii Fluidum.* Fluid Extract of Geranium. (Syn., Fr. Extrait liquide de Géranium maculé; Ger. Flüssiges Fleckenstorchschnabel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., diluted alcohol 90, finishing with latter alone q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract. Tincture. Decoction, 5 p. c. This latter can be made with milk when preferred.

Properties.—Astringent, tonic (due to tannin); good for infants and others having weak stomachs.

Uses.—Similar to tannin: Diarrhœa, chronic dysentery, cholera infantum, hemorrhages. Locally, gleet, leucorrhœa, aphthæ, relaxed vagina, throat, uvula, rectum, indolent ulcers.

Allied Plants:

1. *G. Robertia′num.*—Europe; popular astringent, diuretic for hemorrhages, gravel.
2. *Ero′dium (Geranium) mosch′atum, Storksbill.*—Diaphoretic.
3. *E. cicuta′rium, Heron's-bill.*—Diuretic, dropsy.

RECAPITULATION NO. 5.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Drupaceæ:								
1. Prunus Virginiana. 2. Wild Cherry.	Prunus serotina.	The bark.	N. America.	Amygdalin, emulsin, tannin, resin, gallic acid.	Fluid extract, infusion, syrup.	Sedative, pectoral, tonic, astringent.	Consumption, cough, scrofula, dyspepsia, debility, intermittents.	30–60 (2–4 Gm.)
1. Prunum. 2. Prune.	Prunus domestica.	The fruit.	W. Asia.	Sugar, malic acid, pectin, fixed oil, amygdalin, emulsin.	Confection of senna.	Nutritive, laxative, demulcent.	Constipation.	ad lib.
1. Amygdala Amara. 2. Bitter Almond.	Amygdalus communis var. amara.	The seed.	W. Asia.	Fixed oil, amygdalin, emulsin, proteids, mucilage, sugar.	Syrup, *Oil:* water, spirit.	Demulcent, nutrient, sedative.	Coughs, pulmonary troubles, flavoring.	
1. Amygdala Dulcis. 2. Sweet Almond.	Amygdalus communis var. dulcis.	The seed.	W. Asia.	Fixed oil, mucilage, sugar, proteids.	Syrup, emul., *Oil:* ung. aquæ rosæ.	Demulcent, nutrient.	Diabetes, confectionery.	ad lib.
Mimosaceæ:								
1. Acacia. 2. Acacia (Gum Arabic).	Acacia Senegal.	The gummy exudation.	E. and W. Africa.	Arabic acid combined with Ca, Mg, K, sugar.	Mucilage, syrup, mist. glycyr. co., pulv. cretæ co., emul. amyg., troches.	Demulcent, emollient, nutritive.	Coughs, gastritis, dysentery, hemorrhages, typhoid, emulsifyer, excipient.	ad lib.
1. Catechu. 2. Catechu.	Acacia Catechu.	The extract from the wood.	India.	Catechu-tannic acid, catechin, catechu-red, quercetin.	Tinct. comp., troches.	Astringent, tonic.	Diarrhœa, leucorrhœa, phthisis, bronchitis, relaxed uvula, dyeing.	5–30 (.3–2 Gm.)
Cæsalpinaceæ:								
1. Cassia Fistula. 2. Cassia Fistula (Purging Cassia).	Cathartocarpus (Cassia) Fistula.	The fruit.	E. India.	Sugar, mucilage, pectin, calcium oxalate.	Confection of senna.	Laxative.	Costiveness, promotes bile flow.	60–120 (4–8 Gm.)
1. Senna. 2. Senna.	Cassia: acutifolia, angustifolia.	The leaflets.	E. and C. Africa, India.	Cathartic acid, sennapicrin, sennacrol, chrysophan, phæoretin, sennit, mucilage.	Confection, fluid extract, comp. infusion, syrup, pulv. glycyr. comp., syr. sars. co.	Cathartic.	Constipation, hemorrhoids, fissures, fevers.	30–180 (2–12 Gm.)
1. Tamarindus. 2. Tamarind.	Tamarindus indica.	The preserved pulp of the fruit.	India, Africa, (W. Indies).	Tartaric, malic and acetic acids, potassium compds., sugar, pectin, tannin.	Confection of senna.	Laxative, refrigerant.	Fevers, to correct nausea, quench thirst, sores.	30–300 (2–20 Gm.)
1. Hæmatoxylon. 2. Hæmatoxylon (Logwood).	Hæmatoxylon campechianum.	The heart-wood.	C. America.	Hæmatoxylin, volatile oil, tannin, fat, resin.	Extract.	Astringent, tonic.	Diarrhœa, hemorrhages, dyspepsia, antiseptic, sores.	30–60 (2–4 Gm.)
1. Copaiba. 2. Copaiba (Balsam of Copaiba).	Copaiva Langsdorffii.	The oleo-resin.	Brazil.	Volatile oil, resin, bitter principle, copaivic acid.	Massa, oil.	Diuretic, stimulant, expectorant, laxative.	Urinary troubles, cystitis, diarrhœa, bronchitis, hemorrhoids, dropsy, sores, fissures, gonorrhœa.	Minims. 10–60 (.6–4 Cc.)

Krameriaceæ:								
1. Krameria. 2. Krameria (Rhatany).	Krameria: triandra, Ixina.	The root.	Peru, Bolivia, Colombia.	Kramero-tannic acid, rhatanic-red, starch.	Extract, troches, fld. extr., syrup, tincture.	Astringent, tonic.	Diarrhœa, hemorrhage, gleet, fissures, sore-throat, gums, eyes, nose.	Grains. 5-30 (.3-2 Gm.)
Papilionaceæ:								
1. Balsamum Peruvianum. 2. Balsam of Peru.	Toluifera Pereiræ.	The balsam.	C. America.	Cinnamein, resin, cinnamic acid, benzoic acid, styracin, stilbene.	....	Stimulant, expectorant, vulnerary, stomachic.	Catarrhs, asthma, phthisis, gonorrhœa, rheumatism, ulcers, eczema, scabies.	Minims. 5-30 (.3-2 Cc.)
1. Balsamum Tolutanum. 2. Balsam of Tolu.	Toluifera Balsamum.	The balsam.	S. America.	Resin, volatile oil, cinnamic and benzoic acids.	Syrup, tincture, tinct. benzoin comp.	Stimulant, expectorant, vulnerary.	Bronchitis, catarrhs, coughs, flavor, perfumery.	Grains. 5-30 (.3-2 Gm.)
1. Tragacantha. 2. Tragacanth.	Astragalus gummifer.	The gummy exudation.	W. Asia.	Bassorin, calcium, compound of a gummic acid, starch.	Mucilage.	Demulcent, nutritious.	Coughs, protective, excipient to pills, and troches, expectorant.	5-30 (.3-2 Gm.)
1. Santalum Rubrum. 2. Red Saunders.	Pterocarpus santalinus.	The wood.	S. Asia, Madras.	Santalin, santal, pterocarpin, homopterocarpin.	....	Astringent.	Dyeing, for coloring tinctures, ointments, etc.	
1. Kino. 2. Kino.	Pterocarpus Marsupium.	The inspissated juice.	E. Indies.	Kino-tannic acid, kino-red, pyrocatechin, kinoin.	Tincture.	Astringent, tonic.	Diarrhœa, menorrhagia, leucorrhœa, ulcers, sore-throat.	5-30 (.3-2 Gm.)
1. Glycyrrhiza. 2. Glycyrrhiza (Liquorice Root).	Glycyrrhiza: glabra, glandulifera.	The root.	S. Europe, W. Asia.	Glycyrrhizin, glycyramarin, asparagin, resin, starch.	Extr., tro. g. et opii, tro. am. cl., pure extr., mist. g co., fld. extr., am. gly., syr. sars. co., pulv. g. co., decoc. sars. co., fld. extr. sars. co., mass Hg., pil. ferri iod., pulv. morph. co., tr. aloes, tr. aloes et myrrh.	Demulcent, expectorant, laxative.	Catarrhs, bowel and urinary troubles, coughs, colds.	15-60 (1-4 Gm.)
1. Scoparius. 2. Scoparius (Broom).	Cytisus scoparius.	The tops.	W. Asia, S. and W. Europe, (U. S.).	Volatile oil, sparteine, scoparin, tannin, fat.	Fluid extract, sparteine sulphate.	Diuretic, narcotic, emetic, cathartic.	Cardiac dropsies, asthma, palpitation.	15-30 (1-2 Gm.)
1. Chrysarobinum. 2. Chrysarobin.	Vouacapoua (Andira) Araroba.	The neutral principle.	Brazil.	$C_{30}H_{26}O_7$.	Ointment.	Irritant.	Parasites, ringworm, psoriasis, eczema, hemorrhoids.	⅛ (.008 Gm.)
1. Physostigma. 2. Physostigma (Calabar Bean).	Physostigma venenosum.	The seed.	W. Africa.	Physostigmine (eserine), calabarine, starch, phytosterin, fat.	Extr., tinct., physostigmine salicylate, physostigmine sulphate.	Sedative, contracts pupil, poisonous, emetic, purgative, diaphoretic.	Tetanus, paralysis, chorea, gastralgia, convulsions, strychnine and atropine poisoning.	1-4 (.06-.26 Gm.)
Geraniaceæ:								
1. Geranium. 2. Geranium (Cranesbill).	Geranium maculatum.	The rhizome.	N. America.	Tannin, gallic acid, coloring, starch, sugar.	Fluid extract.	Astringent, tonic.	Diarrhœa, hemorrhage, leucorrhœa, ulcers.	15-60 (1-4 Gm.)

44. LINACEÆ. Flax Family.

Li-na′se-e. L. *Lin-um* + aceæ, flax, fr. Celtic *llin*, a thread, whence Gr. *λίνον*, L. *linum* (classic names), Eng. linen ; *i. e.*, its fabric. Herbs. Distinguished by flowers being regular; stamens 5, monadelphous at base; sepals 5, imbricate, petals 5; ovary 2–5-celled, styles 2–5; fruit capsular, seeds 2 in each cell, albuminous, superior, universal; temperate climates; demulcent, purgative, stimulant, sedative, tonic; fibres, oil.

Genus: 1. **Linum.**

LINUM. LINSEED (FLAXSEED).

Linum usitatissimum, *Linné.* } The seed.

Habitat. C. Asia, Egypt, S. Europe, cultivated in Russia, Egypt, India, United States, S. Europe, England, Holland; spontaneous in most temperate countries.

Syn. Flax, Lint-bells, Winter lien. Br. Lini Semina. Fr. Semence (graine) de Lin. Ger. Leinsame, Flachssamen.

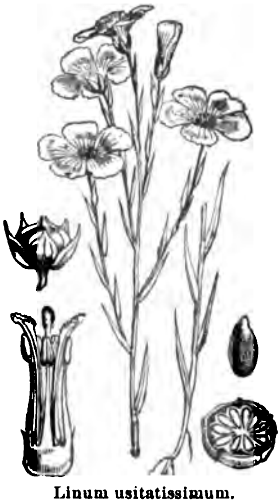
Li′num. L. see etymology, above, of Linaceæ.

U-si-ta-tis′si-mum. L. sup. adj. fr. *usitatus*, most useful, common, familiar.

Flax′seed. AS. *fleax*, *flechten*, to braid, plait, twist; *i. e.*, its fibres, + *seed.*

PLANT.—An annual; stem .6 M. (2°) high, stiff, erect, solitary, round, smooth, green; leaves small, lanceolate, acute, entire, sessile, pale-green, 2–4 Cm. ($\frac{3}{4}$–1$\frac{1}{2}$′) long; flowers June–July; terminal, bluish; fruit August, globular capsule, size of pea, with persistent calyx at base, crowned with sharp spine, 10-seeded in distinct cells. SEED, 5 Mm. ($\frac{1}{5}$′) long, ovate, flattened, oblique, pointed at one end, brown, glossy, covered with transparent mucilaginous epithelium, which swells in water; embryo whitish, with two oily, plano-convex cotyledons, and a thin perisperm; inodorous; taste mucilaginous, oily, bitter. *Solvent:* boiling water. Dose, ʒj–2 (4–8 Gm.).

FIG. 205.



Linum usitatissimum.

The flax is of ancient origin, being prized for its fabric and medical properties; most of our seeds now come from Russia and Germany, but our own country furnishes considerable.

CONSTITUENTS.—Fixed oil 35–40 p. c. (in nucleus), Mucilage, $C_{12}H_{20}O_{10}$, 15 p. c. (in epithelium), proteids 25 p. c., amygdalin, (resin, wax, sugar, no starch, ash 5 p. c. = phosphates, sulphates, chlorides of potassium, calcium, and magnesium).

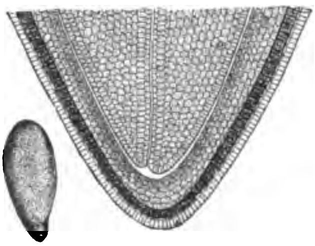
Oleum Lini. Linseed Oil, *official.*—(Syn., Oil of Flaxseed; Fr. Huile de Lin; Ger. Leinöl, Leinsamenöl.) A fixed oil expressed without heat. Usually, however, the seeds are dried with heat, then crushed, and pressed; yield by cold process 16–20 p. c., by heat 25–28 p. c. It is a yellowish, oily, limpid liquid, of peculiar odor, bland taste; by exposure thickens, acquiring a strong odor and taste; sp. gr. 0.930–0.940; congeals at −20° C. (−4° F.); soluble in ether, chloroform, oil of turpentine, 10 parts alcohol. Consists of linolein 80 p. c., with glycerides of palmitin, myristin, and olein. Linolein is the drying property, being the glyceride of linoleic acid, otherwise same as the non-drying olein; upon exposure is converted into oxylinoleic acid hydrate, then finally into linoxyn, $C_{32}H_{54}O_{11}$, which is insoluble in ether and very soon forms in the boiled oil. The oil expressed with heat is darker, of stronger odor and more acrid taste.

Impurities: Free acid, non-drying oils, paraffin oils, cod-liver oil. Dose, ℥ss–2 (15–60 Cc.).

PREPARATIONS.—OIL: 1. *Linimentum Calcis,* 50 p. c.; use externally.

2. *Sapo Mollis.* Soft Soap. (Syn., Sapo Viridis, Green Soap; Fr. Savon (mou) vert; Ger. Kaliseife, Grüne seife.)

FIG. 206.



Flaxseed, entire, magnified 3 diam.; transverse section near the edge, magnified 65 diam.

Manufacture: Dissolve potassa 90 Gm. in water 450 Cc., add alcohol 40; add this to linseed oil 400 Gm., heat until mixture soluble in boiling water without separation of oily drops. This is potassium oleate, as common soap is sodium oleate; it is a soft, unctuous mass, brownish-yellow, soluble in 5 parts hot water, 2 alcohol.

Prep.: 1. *Linimentum Saponis Molli.* Liniment of Soft Soap. (Syn., Tinctura Saponis Viridis, Spiritus Saponis Kalinus Hebra; Fr. Teinture de Savon vert Ger. Hebra's Seifenspiritus.)

Manufacture: Dissolve oil of lavender 2 Cc. in alcohol 30, to this add soft soap 65 Gm., agitate, filter, adding water q. s. 100 Cc.

Unoff. Preps.: SEED. *Infusion,* 5 p. c. *Compound Infusion,* 5 p. c. + liquorice root 2 p. c. These were once official and are effective from the dissolved mucilage of the epithelium (testa), which is only altered starch. Dose, *ad libitum.* *Decoction,* 5 p. c. *Poultice.*

PROPERTIES.—Demulcent, emollient, diluent, diuretic.

USES.—*Infusion* or tea for inflammation of mucous membranes of respiratory, digestive, and urinary organs, renal and vesical irritation, catarrh, dysentery, calculi, strangury. *Decoction,* owing to the oil it contains, is less acceptable to the mouth, but all the better for enema. *Poultice* of ground meal to enlarged glands, swellings, boils, pneumonia, etc., made by adding boiling water to meal for proper consistency. Should coat skin with glycerin, olive or other oil before applying, and place as closely to ailing spot as possible; may cover with oiled silk to retain heat and moisture, and may add olive oil, laudanum, or any anodyne, stimulating, or astringent solution to poultice. The oil is laxative (℥j; 30 Cc.), excellent in piles (℥j–2; 30–60 Cc. night and morning); it is sometimes added to purgative enemata, also to cover erysipelatous and irritated skin surfaces, but with the disadvantages of soon drying (thus rendering skin stiff) and becoming sour and irritating. The *linimentum calcis* is applied to fresh burns to modify irritation.

Allied Products:

1. *Lini Farina.*—Flaxseed (linseed) meal, official, 1860–1880; prepared by grinding official seed, and for medicinal uses, should be fresh, free from unpleasant or rancid odor, and when extracted with carbon disulphide should yield not less than 25 p. c. fixed oil. The filtered infusion has an insipid mucilaginous taste and should not be blue with iodine T. S. (abs. starch). *Adulterations:* Cornmeal, starches, flour.

2. *Flaxseed Cake.*—Oil cake. Flaxseed when ground yields cake-meal, and this, after being deprived of oil, becomes oil cake; it still contains all of the nitrogen, 4–5 p. c., and, moreover, a little oil, thus serving well as a cattle food; yields ash 5–8 p. c.

3. *Boiled Linseed Oil.*—Obtained by heating oleum lini to 130° C. (266° F.), when it boils, losing 6–8 p. c. by weight; it is darker in color, thicker, and dries faster, hence useful in painting, varnishing, etc.

4. *Flax liber-fibres.*—These furnish our linen, which, when scraped, gives lint, while the primitive short fibre is useful as tow.

45. ERYTHROXYLACEÆ. Coca Family.

E-rith-rox-sil-a′se-e. L. *Erythroxyl-on* + aceæ, fr. Gr. ερυθρός, red, + ξύλον, wood; *i. e.*, some species have red wood. Shrubs, trees. Distinguished by flowers regular, small, calyx 5-lobed, petals 5, stamens 10, ovary 1–3-celled, superior; fruit drupe; temperate climates, tropics; stimulant, tonic, narcotic, dye.

Genus: 1. **Erythroxylon.**

COCA. COCA (ERYTHROXYLON).

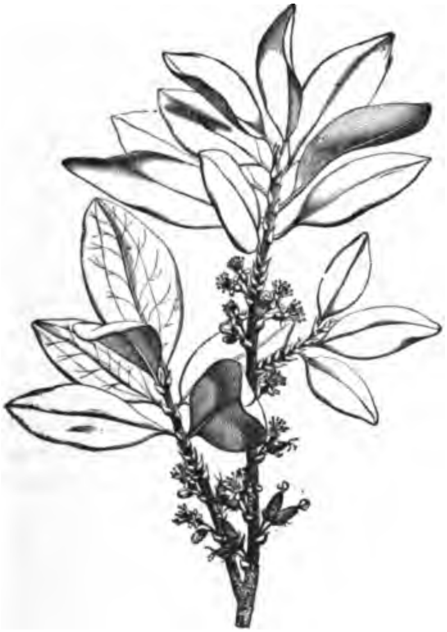
Erythroxylon Coca, *Lamarck.* } The leaves.

Habitat. Peru, Bolivia (Colombia, Brazil, India, Ceylon, Java), cultivated.
Syn. Spadic, Coca leaves, Cuca. Fr. Feuilles de Coca. Ger. Coca blätter.
Er-y-throx′y-lon. L. see etymology, above, of Erythroxylaceæ.
Co′ca. Sp. fr. native name, meaning tree or plant, *par excellence.*

PLANT.—Shrub 1–2 M. (3–6°) high, with many spreading, purplish-brown branches, wrinkled bark, twigs smooth; flowers yellow, small, petals 5; stamens 10; fruit reddish drupe, oval, 12 Mm. (½′) long, sarcocarp scanty. LEAVES, oval-elliptical, 2.5–5 Cm. (1–2′) long, 2–4 Cm. (¾–1½′) wide, bright-green above, paler and glaucous beneath, petiole short, entire, obtuse or emarginate, both sides reticulate, midrib prominent, having on each side, on the under surface, a parallel, slightly curved line, running from base to apex, due to strands of collenchyme cells; odor slight, tea-like; taste aromatic, bitter, when chewed temporarily benumbs the lips and tongue. *Solvent:* diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

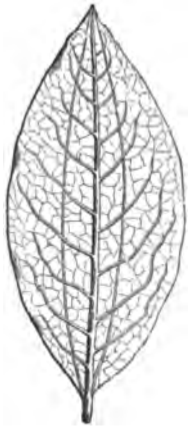
Commercial.—Coca, although not introduced into England until 1870, was used by the aborigines in S. America prior to the Spanish conquest. They considered it a divine gift, used it in religious services, and spoke of it as a God-given plant, satisfying hunger, strengthening the weak, and banishing man's misfortunes. The invaders, not liking such homage, forbade its use and cultivation until they observed it enabled the conquered to do more work for them. It is now largely cultivated in the Andes, at 600–1,500 M. (2,000–5,000°) elevation, on plantations (*cocales*) cleared from the forests on the warm declivities, the largest being in La Paz province, Bolivia. Plant is propagated as our peach, yielding at the second year and continuing for fifty. Leaves, when bright-green above and yellow-green below, are carefully picked to avoid breaking them or injuring the young leaf buds, which form the second crop; they are carried away in baskets, spread on unroofed floors and dried quickly in the sun (if too rapidly, lose odor and green color; if too slowly, acquire disagreeable odor and taste), and packed in bags (*cestos*) 25–50 lbs. (11.6–23.3 Kg.), or tin-lined boxes to better prevent deterioration in transportation, which results from fermen-

Fig. 207.



Erythroxylon Coca.

Fig. 208.



Coca leaf, underside, usual size.

tative decomposition. There are 3–4 harvests yearly, the Sept. being best, the April next, each yielding 300–900 lbs. (140–420 Kg.) per acre. Total annual yield 80,000,000 lbs. (37,383,177 Kg.), chiefly exported from Lima. There are two commercial varieties.

1. *Truxillo,* after the N. Peru seaport. Leaves occur much broken, are thin, bright colored, fragile, fibro-vascular bundles circular, smaller, narrower, more lanceolate, and lateral lines finer than in next variety. Java and India coca (*E. Coca,* var. *Sprucea'num*) is identical with Truxillo, but owing to inferiority is not exported.

2. *Huanuco* or *Cuzco,* after the cities of S. E. Peru (*E. Coca* and var. *bolivia'num*). Leaves occur not much broken, thick, coriaceous, fibro-vascular bundles flat, spread out. The true Bolivian Coca has larger fruit, smaller leaves, are the best, seldom exported, being used at home.

CONSTITUENTS.—Hygrine, Cocaine 0.36–1.67 p. c., benzoyl-ecgonine, cinnamylcocaine, truxilcocaine (truxilline or cocamine), coca-tannic acid, coca wax.

Hygrine.—Volatile, aromatic, liquid alkaloid, yellow, burning taste, odor of trimethylamine, soluble in water, alcohol, ether, aqueous solutions of salts fluorescent. Some claim this not to be a constituent of coca, but to be obtained from the solvent used in the separation of the alkaloids.

Cocaina, Cocaine (*methyl-benzoyl-ecgonine*), $C_{17}H_{21}NO_4$.—An alkaloid consisting of methyl alcohol, benzoic acid and ecgonine, $C_9H_{15}NO_3$, into which it separates by heating with strong hydrochloric acid. Obtained by moistening leaves with solution of soda, and treating with benzin, from which the alkaloids, as salts, can be transferred to diluted sulphuric acid by agitation; upon adding an excess of soda solution the lesser alkaloids and cocaine are precipitated (hygrine remaining in solution); cocaine can now be separated by filtering and expressing, and purified by crystallizing from alcohol; occurs in white, bitter prisms, soluble in water, alcohol, ether; forms salts (hydrochlorate, nitrate, sulphate, etc.).

Cocainæ Hydrochloras, Cocaine Hydrochlorate, $C_{17}H_{21}NO_4HCl$, *official.*—Obtained by dissolving the pure alkaloid in alcoholic solution of hydrochloric acid, and crystallizing the anhydrous salt; occurs in white transparent crystals or powder, odorless, bitter, with tingling and numbing sensations to the tongue, soluble in 0.48 part water, 3.5 alcohol, no residue. *Tests:* 1. Potassium permanganate gives a violet-purple precipitate. 2. Chromic acid gives yellow precipitate, dissolving upon shaking; now add hydrochloric acid getting permanent orange precipitate. 3. Rubbed with mercurous chloride on porcelain, then breathed upon, gives grayish-black color. 4. With silver nitrate T. S. get white precipitate insoluble in nitric acid.

This salt is most always dispensed under the name of cocaine, usually in (hypodermic) solutions of 2, 4, 5, 10 p. c. Dose, gr. $\frac{1}{8}$–2 (.008–.13 Gm.).

PREPARATIONS.—1. *Extractum Cocæ Fluidum.* Fluid Extract of

Coca. (Syn., Br. Extractum Cocæ Liquidum; Fr. Extrait liquide de Coca; Ger. Flüssiges Cocablätter-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Tincture, 20 p. c. (diluted alcohol). Dose, ʒj–4 (4–15 Cc.). *Vinum,* 10 p. c. Dose, ʒij–4 (8–15 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). *Oleate of Cocaine,* 10 p. c., used externally.

PROPERTIES.—Cerebral stimulant, bitter tonic, diuretic, mydriatic, diaphoretic, anaphrodisiac, narcotic. Locally, has no action upon the unbroken skin, but acts upon mucous membranes and subcutaneous tissue as anæsthetic and analgesic, producing also its constitutional effects. It increases digestion, respiration, heart action, temperature, arterial tension, and the irritability of the sensory nerves, followed by mental, moral and muscular depression. It anæsthetizes the gastric mucous membrane, thereby temporarily deadening the sensation of hunger and thirst, which, however, seem all the greater as the effects of the drug wear off; the brain is stimulated by increasing the blood supply, producing wakefulness, a sense of hilarity and well-being (similar to cannabis indica), increased muscular strength and endurance. Acts as a diuretic by checking waste processes, lessening the quantity of urea, but increases that of urine; dilates the pupil by stimulating the ends of sympathetic nerve in the iris. When full amount is chewed one works cheerfully as long as the effect lasts, irrespective of meal hour, which may continue 3–4 days from repeated doses—usually, however, food is taken at night, and only the meal of mid-day bridged over. Natives drink its tea like Chinese tea elsewhere, and carry a bag of leaves and one of ashes or lime; after forming a cud of the leaves deprived of ribs (ʒj; 4 Gm.) a little ash or lime is added to give pungency and to aid the secretion of saliva; each chew lasts an hour, when a new one follows. Cocaine, in general action, resembles atropine; causes little injury to natives, but strangers become haggard-looking and idiotic.

USES.—In melancholia, epilepsy, spinal paralysis, insanity, diabetes, headache, typhoid state, opium-habit, uterine inertia, cholera morbus, spermatorrhœa, debility, poisoning by chloral hydrate, opium or bromides. Locally, to burns, painful ulcers, fissures of anus, hay fever, sore throat, laryngitis, hemorrhoids, bronchitis, coryza, and in surgical operations.

Poisoning: Usually have convulsions, unconsciousness, failure of circulation, slow respiration and dilated pupils. No more than gr. ¾ (.045 Gm.) should be applied at once. Empty the stomach, then stimulants—amyl nitrite, caffeine, atropine, ammonia inhalations; chloral hydrate, chloroform, ether or morphine injections; strychnine, artificial respiration. Chronic poisoning (*cocainism* or *habit*) is nearly as degenerative and serious as that of opium, and may be treated similarly, but usage does not create nerve irritation to the same extent, consequently one with a strong will power can desist abruptly the use without suffering other than the want of mental satisfaction and pleasures the craving for which it tends to establish.

Incompatibles: Alkalies, alkaline carbonates and bicarbonates, mercuric chloride, iodine, iodides, ammonia, zinc chloride, borax.

Synergists: Cerebral effects—alcohol, cannabis indica, belladonna; analgesic—atropine, carbolic acid, conium, opium; mydriatic—atropine.

46. ZYGOPHYLLACEÆ. Guaiacum or Bean-caper Family.

Zu-go-fi-la′se-e. L. *Zygophyll-um* + aceæ, fr. Gr. ζυγόν, yoke, + φύλλον, leaf; *i. e.*, leaves foliolate, yoked and in pairs. Herbs, trees, shrubs. Distinguished by flowers, white, red, yellow with fleshy disk; sepals 5, free, glandless; petals 4–5, filaments 8–10, having small scales; ovary lobed, 4–12-celled, superior, 2 filiform ovules in each, little or no albumin; beyond tropics; stimulant, alterative, diaphoretic, anthelmintic; wood hard, durable.

Genus: 1. **Guaiacum (Guajacum).**

GUAIACUM. GUAIAC.

1. Guaiaci Lignum. Guaiacum Wood.
2. Guaiaci Resina. Guaiac.

Guaiacum { **officinale,** *Linné,* **sanctum,** *Linné.* } 1. The heart-wood of both species. 2. The resin of the wood of first species.

Habitat. 1. West Indies, South America (Jamaica, Hayti, Cuba, Colombia, Venezuela). 2. West Indies (Cuba, Bahamas, Florida).

Syn. Lignum Vitæ, Sanctum or Benedictum, Rockwood. Fr. Gaïac, Gayac, Bois de Gayac. Ger. Guajakholz, Franzosenholz, Pockenholz, Lignum Guajaci. Fr. Résine de Gayac. Ger. Resina Guajaci, Guajak.

Gua′ia-cum. L. fr. Sp. *guayaco, guayacan; i. e.*, plant's native Haytian name.
Of-fi-ci-na′le. L. see etymology of (*Rheum*) *officinale*, page 168.
Sanc′tum. L. *sanctus, sancere,* consecrate; *i. e.*, used as incense in worship.
Guaiac. The correct S. American name of the tree.

Plants.—1. *Guaiacum* (*Guajacum*) *officinale.*—This is a tree 6–12 M. (20–40°) high, trunk .3–.5 M. (1–1½°) thick, branches knotty, stem-bark ash-gray, striated, variegated with greenish or purplish spots; leaves 7.5 Cm. (3′) long, evergreen, paripinnate, 2–4 pairs; leaflets obovate, 2.5–4 Cm. (1–1½′) long; flowers large, blue, 4–10, in axils of upper leaves; sepals 5; petals 5; stamens 10, about 18 Mm. (¾′) long; fruit capsule, 2-celled, each 1-seeded (black), obcordate.

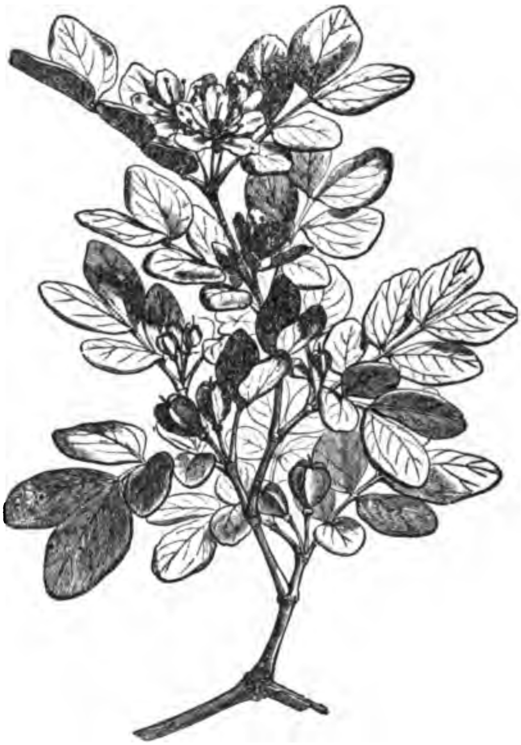
2. *Guaiacum* (*Guajacum*) *sanctum.*—This is a tree 6–9 M. (20–30°) high; leaflets narrower, mucronate; fruit 5-celled, seeds red; wood paler and less dense.

Heart-wood, heavier than water, sp. gr. 1.30, hard, in billets or logs, brown or greenish-brown, resinous, with irregular, concentric circles surrounded by yellowish alburnum, splitting irregularly, when heated emits balsamic odor; taste slightly acrid. In shops as raspings, greenish-brown with few white particles. *Test:* Should with nitric acid and other oxidizing agents turn bluish-green. *Solvents:* alcohol; boiling water partially. Dose, ʒss–2 (2–8 Gm.). Resin (guaiac), in irregular, brittle masses or subglobular tears 12–25 Mm. (½–1′) thick, greenish-brown, internally of a glossy lustre, but if recent reddish-brown, transparent in thin splinters, sp. gr. 1.20; melts at 85° C. (185° F.), feebly aromatic, acrid, odor stronger upon heating; powder grayish, but green on exposure. *Solvents:* alcohol; acetone; chloroform, ether, alkalies; the former solution blue with tincture ferric chloride, chlorine, chromic acid, and other oxidizing agents. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—While no other wood is known to be used for such purpose, yet out of a dozen shop-specimens examined only one was observed to have resin. The resin being carelessly collected may contain admixtures to 10, 15, 30 p. c.; thus *rosin* (heat for odor, or oil of turpentine will dissolve its own resin, leaving guaiac untouched), *damar* (80–90 p. c. soluble in benzin), *Peru guaiac resin* (42 p. c. soluble in benzin), *Carana resin* (alcoholic solution not precipitated by lead acetate), also *bark*.

Commercial. — The best *lignum vitæ* (wood of life; *i. e.*, its virtues thought to prolong life) comes from St. Domingo in logs several feet long, with adhering gray bark, showing on edges shining crystals of calcium sulphate; the bark and yellow sap-wood are removed and the dark, hard heart-wood is turned and shaped into various implements, etc., the wastings being reserved for medicine.

FIG. 209.



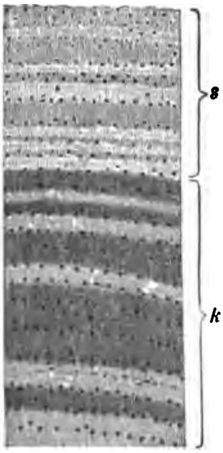
Guaiacum sanctum.

The finest *resin* is also from St. Domingo, although very good comes from Jamaica and Hayti ports. This is obtained: (1) As a natural exudation; (2) by incisions made into the bark; (3) by logs being scarified in the middle, then suspended horizontally in the air by two uprights and fire applied at both ends, whereby melted resin runs out from the centre into calabash cups.

CONSTITUENTS.—I. WOOD: Resin 20–25 p. c., aqueous extract

3–4 p. c., ash 1 p. c. II. RESIN: Guaiaretic acid, $C_{20}H_{26}O_4$, 10 p. c., Guaiaconic acid, $C_{19}H_{20}O_5$, 70 p. c., Guaiac beta-resin 10 p. c., gum 4 p. c., guaiacic acid, guaiac-yellow. Last two are crystalline and can be dissolved out by milk of lime; if residue is now treated with hot alcohol, evaporated, and this residue in turn dissolved in hot solution of soda, the sodium salt of guaiaretic acid crystallizes out, while the mother-liquor contains guaiaconic acid and beta-resin, which, after removing alkali, are separated by ether, the latter being insoluble. Guaiaretic acid has a faint vanilla odor, is crystalline, not blue with nitric acid; guaiaconic acid is amorphous, colored blue by nitric acid and other oxidizing agents, guaiac-yellow occurs in pale-yellow quadratic octahedra, having a bitter taste. By dry distillation of guaiac get: 1. *Guaiacene*, C_5H_8O (odor of bitter-almond). 2. *Guaiacol*, $C_7H_8O_2$ (a colorless aromatic oil, green, with ferric chloride). 3. *Creosol*, $C_8H_{10}O_2$ (resembles guaiacol). 4. *Pyroguaiacin*, $C_{18}H_{18}O_3$ (in inodorous scales, green by ferric chloride, blue with warm sulphuric acid).

FIG. 210.



Guaiacum wood; cross-section, magnified four times; *k*, heart-wood; *s*, sapwood.

PREPARATIONS.—I. WOOD: 1. *Decoctum Sarsaparillæ Compositum*, 2 p. c. Dose, ℥j–4 (30–120 Cc.).

Unoff. Prep.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

II. RESIN: 1. *Tinctura Guaiaci.* Tincture of Guaiac. (Syn., Fr. Teinture de Résine de Gaïac; Ger. Tinctura Guajaci, Guajaktinktur.)

Manufacture: 20 p. c. Macerate 20 Gm. with alcohol q. s. 100 Cc. Dose, ♏v–60 (.3–4 Cc.).

2. *Tinctura Guaiaci Ammoniata.*—Ammoniated Tincture of Guaiac. (Syn., Tinctura Guaiaci Composita; Fr. Teinture de Gaïac Ammoniacale; Ger. Ammoniakalische Guajaktinktur.)

Manufacture: 20 p. c. Macerate 20 Gm. with aromatic spirit of ammonia q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

3. *Pilulæ Antimonii Compositæ*, gr. 1¼ (.08 Gm.). Dose, 1–3 pills.

Unoff. Preps.: Mixture (Mistura), Syrup.

PROPERTIES.—Alterative, diaphoretic, expectorant, stimulant, antiseptic, astringent. Stimulates the flow of saliva, bronchial mucus, bile and gastric juice, causing sometimes vomiting and purging; increases heart force and rapidity, dilates cutaneous blood vessels, and large doses contract uterus. It is eliminated by bowels, kidneys, bronchi, but chiefly kidneys.

USES.—The wood, owing to its weakness, is now seldom used in medicine; was first employed in Europe 1508, and the Spaniards prized it highly at that period and since, for syphilis, rheumatism, gout, scrofula, skin eruptions. Its great service is in furnishing resin, and (owing to its hardness, toughness, density, and durability), for making pestles, blocks, pulleys, rulers, skittle and bowling balls, hawser bearings, etc.

The resin, although very strong, is becoming less used owing to the more powerful chemical alteratives as potassium and sodium iodides, etc. Good in rheumatism, gout, lumbago, syphilis, scrofula, skin eruptions, amenorrhœa, dysmenorrhœa, diphtheria, tonsillitis (quinsy). Guaiacol is often substituted for creosote in phthisis, coughs, etc. Dose, ♏j–4 (.06–.26 Cc.).

Incompatibles: Spirit of nitrous ether, mineral acids, water.

Synergists: Sarsaparilla, stillingia, mezereum, sassafras, other diaphoretics, and some diuretics.

Allied Plant:

1. *G. angustifo'lium.*—S. Texas, Mexico. Wood hard, heavy, splitting irregularly, yellowish-brown. Sometimes substituted for the official.

47. RUTACEÆ. Rue Family.

Ru-ta'se-e. L. *Rut-a* + aceæ, fem. pl. of *rutaceus*, of or resembling rue, fr. Gr. ῥυτή, ῥύω, to flow, referring to medical properties (female). Trees, herbs, shrubs. Distinguished by leaves exstipulate, dotted with pellucid glands, containing aromatic volatile oil; sepals 4–5; petals 4–5, imbricated; ovary connate or united by base, style, or stigma, superior; stamens distinct, equal or double the petals; albuminous or exalbuminous; tropics; antispasmodic, tonic, febrifuge, diuretic.

Genera: 1. **Xanthoxylum.** 2. **Pilocarpus.** 3. **Barosma.** 4. **Citrus.**

XANTHOXYLUM. XANTHOXYLUM (PRICKLY ASH).

Xanthoxylum { **americanum,** *Miller,*
Clava-Herculis, *Linné.* } The bark.

Habitat. North America. 1. Canada to Virginia and North Carolina, rocky woods, river banks. 2. Virginia to Florida, westward to Texas, sandy coast, dry soil.

Syn. 1. Northern Prickly Ash, Angelica Tree, Pepper or Yellow Wood, Pellitory or Toothache Bark or Tree. 2. Southern, West India or Yellow Prickly Ash, Sea Ash, Pepper-wood, Hercules Club, Yellow Hercules, Prickly Yellow Wood. Fr. Clavalier, Frêne épineux. Ger. Zahnwehholz.

Xan-thox'y-lum. L. fr. Gr. ξανθός, yellow, + ξύλον, wood; *i. e.*, roots are yellow.

A-mer-i-can'um. L. belonging to America, American.

Cla'va-Her'cu-lis. L. *clava*, club, + *Hercules; i. e.*, resemblance of cone-like warts.

PLANTS.—1. *Xanthoxylum americanum.* Shrub 2–4 M. (6–12°) high, covered with sharp scattered prickles; leaves imparipinnate, leaflets 4–5 pairs, ovate, downy; flowers April–May, before the leaves, yellowish-green, sessile, umbels, polygamous, sepaloid; fruit capsule, oval, punctate, greenish-red, 2-valved, 1 black seed.

2. *Xanthoxylum Clava-Herculis.* Small tree 6–12 M. (20–40°) high, bark with prickles protruding through large corky cones, larger

prickles on branches and petioles; leaflets 3–8 pairs, crenate, unequal-sided, shining; flowers June, after leaves appear, cymes.

BARK, curved or quilled, 1 Mm. ($\frac{1}{25}$′) thick, brownish-gray, with white patches and minute black dots, faintly furrowed, with a few straight, two-edged spines 5 Mm. ($\frac{1}{5}$′) long; inner surface whitish, smooth, fracture short, non-fibrous, green in the outer, yellowish in the inner layer. Southern bark (*X. Clava-Herculis*) about twice as thick, with many conical corky projections 2.5 Cm. (1′) high, and stout, brown spines rising from a corky base; inodorous; taste bitterish, very pungent; neither should be confounded with *Ara'lia spino'sa, Hercules' Club*, bark of which is nearly smooth externally, but that of stem is beset with very sharp slender prickles in transverse rows. *Solvents:* alcohol; boiling water. Dose, gr. 10–30 (.6–2 Gm.).

CONSTITUENTS.—Similar in both barks but not identical: Resins (2), Bitter principle (xanthoxylin-e), volatile oil (acrid, green), tannin, sugar, ash 12 p. c.

Resins.—One crystalline, white, tasteless, bitter in alcoholic solution; the other soft, acrid, constituting the brownish powder, xanthoxylin, resinoid of the "Eclectics." Dose, gr. 1–2 (.06–.13 Gm.).

Bitter Principle (xanthoxylin-e).—Probably an alkaloid identical with berberine; with sulphuric acid brown and dark-red.

PREPARATIONS.—1. *Extractum Xanthoxyli Fluidum.* Fluid Extract of Xanthoxylum. (Syn., Fr. Extrait liquide de Frêne épineux; Ger. Flüssiges Zahnwehholz-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏x–30 (.3–2 Cc.).

Unoff. Preps.: Extract. Dose, gr. 3–10 (.2–.6 Gm.). *Decoction,* 5 p. c. Dose, ℥ss–2 (15–60 Cc.).

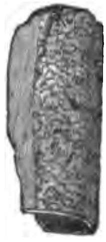
PROPERTIES.—Alterative, stimulant, sialagogue, emmenagogue, diaphoretic, diuretic, causes salivation, tingling in tongue, increases cardiac action and arterial tension, also secretion from stomach, intestines, liver and pancreas; resembles mezereum, guaiac, sanguinaria, and stillingia in action.

USES.—Chronic rheumatism, myalgia, lumbago, dropsies, atonic dyspepsia, syphilis, pharyngitis, as a masticatory for toothache, tongue paralysis. Externally as a counter-irritant in female pelvic diseases.

Allied Plants:

1. *X. flori'danum, Satin Wood.*—Identical with *X. cari'bæum; X. ptero'ta*, Florida, Texas, Brazil; wood yellow, hard; bark and leaves pungent.

FIG. 211.



Angustura bark, one-half natural size.

2. *Cuspa'ria Angostu'ra* (*Galipe'a Cusparia*), *Angustura.*—The bark official, 1820–1880. Northern South America. Tree 4.5–6 M. (15–20°) high, leaves with three leaflets, 15–25 Cm. (6–10′) long, 5–10 Cm. (2–4′) broad, spotted white, tobacco-odor, flowers white; bark in flat, curved, or quilled pieces 2.5 Mm. ($\frac{1}{10}$′) thick, ochrey-gray, friable periderm, inside cinnamon-red, striæ of calcium oxalate, aromatic, bitter; contains volatile oil, resin, angusturin, four alkaloids. Used

for diarrhœa, dysentery, dyspepsia, typhoid, stimulant, febrifuge, large doses emetic; in infusion, tincture, extract. Dose, gr. 10–30 (.3–2 Gm.).

False Angustura Bark (*Stry′chnos Nux-vo′mica*) has stone-cells, no striæ of calcium oxalate; is very bitter, not aromatic, contains strychnine, brucine.

PILOCARPUS. PILOCARPUS (JABORANDI).

Pilocarpus Jaborandi, *Holmes.*
Pilocarpus pennatifolius, *Lamarck.* } The leaflets.
(**P. Selloanus,** *Engler.*)

Habitat. 1. Brazil, Paraguay. 2. Brazil, near Pernambuco; in forest-clearings on the hill slopes.

Syn. Br. Pilocarpi Foliata. Fr. Jaborandi. Ger. Folia Jaborandi. 1. Rio Janeiro Jaborandi. 2. Pernambuco Jaborandi.

Pi-lo-car′pus. L. *pilus*, hair, or fr. Gr. *πῖλος*, a cap, + *καρπός*, fruit; *i. e.*, fruit hat-shaped.

Jab-o-ran′di. L. fr. Pg. *zha-bo-ran-de′; i. e.*, South American name.

Pen-nat-i-fo′li-us. L. *pennatus, pinnatus*, feathered, winged, + *folium*, leaf; *i. e.*, leaves compound, having leaflets arranged on each side of a common petiole as the barbs (laminæ) of a feather.

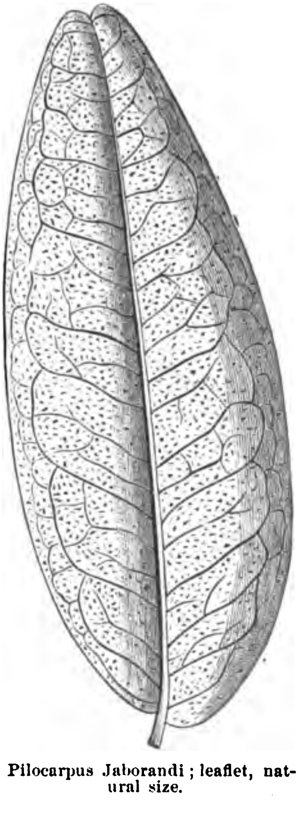
Sel-lo-a′nus. L. after Professor Sello, German botanist, who gave the genus much study.

PLANTS.—Shrubs 1.2–1.5 M. (4–5°) high, branches erect; bark smooth, with gray and white dots, root 18 Mm. (¾′) thick; flowers small, pinkish-purple, pedicellate, racemes 45 Cm. (18′) long; fruit, 5 carpels 4 Cm. (1½′) long, compressed, curved ridges dotted with oil-glands, carpels 1-seeded, reniform, black; leaves imparipinnate, .3–.4 M. (1–1½°) long, 2–5 pairs. LEAFLETS, 10–12.5 Cm. (4–5′) long, 2.5–4 Cm. (1–1½′) broad, short stalked, oval, entire, slightly revolute at the margin, obtuse, emarginate, unequal at base, dull-green; coriaceous, pellucid-punctate, smoothish, if bruised aromatic; taste bitter, pungent. *Solvents:* diluted alcohol; boiling water partially. Dose, gr. 15–30 (1–2 Gm.).

ADULTERATIONS.—With leaves of allied species and of some piperaceous plants; these latter can be distinguished by being thin, subcoriaceous, ovate, acuminate, finely granular and not pellucid-punctate.

Commercial.—This plant was introduced into Europe in 1847, and is now cultivated. The names *Jaborandi*, *Jamborandi*, *Iaborandi* are applied natively, in both generic and specific sense, to several dissimilar plants having sialagogue, diaphoretic, and pungent

FIG. 212.



Pilocarpus Jaborandi; leaflet, natural size.

sudorific properties as *Serro'nea Jabora'ndi, Piper Jabora'ndi* (possibly the true Jaborandi), *P. unguicula'tum, P. citrifo'lium, P. reticula'tum, P. Mollico'mum, Erte'la* (*Auble'tia*) *trifo'lia, Xantho'xylum e'legans.*

CONSTITUENTS.—Pilocarpine ¼–½ p. c., Jaborine, Volatile oil ½–¾ p. c., malic acid, salts.

Pilocarpine (*pilocarpina*), $C_{11}H_{16}N_2O_2$.—Was first obtained as volatile alkaloid (jaborandine), but now as crystalline solid, soluble in water, combining with alkalies. Now prepared by exhausting with acidulated alcohol (HCl), filtering the evaporated tincture (to remove fat and resin), and adding ammonia; shake with chloroform to extract the liberated alkaloids, concentrate to syrup, neutralize with nitric acid, take up the nitrate with alcohol, from which it crystallizes, leaving pilocarpidine and jaborine nitrates in solution. When heated with hydrochloric acid yields pilocarpidine and jaborine, which is only altered pilocarpine. It resembles nicotine in action.

Pilocarpinæ Hydrochloras, Pilocarpine Hydrochlorate, $C_{11}H_{16}N_2O_2HCl$, *official.*—Prepared by neutralizing the alkaloid with diluted hydrochloric acid and evaporating to crystallization. Occurs in small white crystals, odorless, bitter, deliquescent; soluble in water, alcohol, no residue. *Tests:* 1. With sulphuric acid to dissolve + potassium dichromate crystal get dark-green color. 2. Soda T. S. only precipitates in strong solutions; silver nitrate T. S. gives white precipitate insoluble in nitric acid. Should be kept in small well-stoppered vials. Dose, gr. ⅛–½ (.008–.03 Gm.), administered best hypodermically (2 p. c. aqueous solution).

Jaborine, $C_{22}H_{32}N_4O_4$.—Also present in leaves, is yellow, amorphous; less soluble in water, more so in ether than pilocarpine, is isomeric with it (same molecular formula) and antagonizes its action, resembling atropine; it is to the presence of this, in greater or less amount, that commercial pilocarpine has such varying effects, hence this latter salt should be pure.

Pilocarpidine, $C_{10}H_{14}N_2O_2$.—Is weaker than pilocarpine; deliquesces, on oxidation in air yields syrupy jaboridine (possibly identical with jaborandine, $C_{10}H_{12}N_2O_3$), having the action of jaborine; treated with silver nitrate in excess get jaboric acid, which closely resembles jaborine.

Volatile Oil.—Obtained by distillation at 176° C. (350° F.) and is chiefly a terpene (pilocarpene), $C_{10}H_{16}$, with a little solid paraffin-like substance, sp. gr. 0.875.

PREPARATIONS.—1. *Extractum Pilocarpi Fluidum.* Fluid Extract of Pilocarpus. (Syn., Fr. Extrait liquide de Jaborandi; Ger. Flüssiges Jaborandi-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

Unoff. Preps.: Extract. Dose, gr. 3–10 (.2–.6 Gm.). *Tincture,* 25 p. c. (alcoholic). Dose, ʒj–2 (4–8 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). Pilocarpine nitrate (Br.), phosphate, acetate, hydrobromate. Dose, each gr. ⅛–½ (.008–.03 Gm.) (hypodermically).

Properties.—Diaphoretic, sialagogue, myotic, cardiac depressant, emetic, diuretic (repeated small doses), galactagogue, abortive. Full doses cause flushed face, quickened circulation and respiration, profuse sweating and salivation (lasting 2–4 hours, losing in perspiration 9–15 ozs. (.27–.45 L.), in saliva 10–27 ozs. (.3–.8 L.), these always being in the inverse ratio); increases bronchial, nasal, mammary, gastric and intestinal juices, lowers temperature 1–4 degrees, contracts pupils, produces chilliness and debility. The heart soon becomes slowed and arterial pressure lowered, by stimulating the terminations of the vagus, or by depressing the motor centres in the heart-muscle. Both the fluid and solids (especially urea) of the perspiration are increased by direct influence on the nerve-endings governing its secretion, while the cells of the salivary glands are directly stimulated.

Uses.—Dropsies, pleurisy, uræmia, pulmonic œdema, catarrhal jaundice, mumps, rheumatism, coryza, cold, influenza, Bright's disease, meningitis, diabetes, agalactia, parotitis, asthma, hiccough, erysipelas, diphtheria; best antidote to atropine, hyoscyamine, daturine, etc. In ophthalmia use pilocarpine, in amblyopia (from alcohol or tobacco), detached retina, chronic iritis, keratitis, glaucoma, atrophic choroiditis, instead of eserine as a myositic. To avoid nausea may give in form of enema.

Poisoning: Empty the stomach and wash it out with tannin; give atropine hypodermically and morphine to control nausea and vomiting; cardiac stimulants if necessary.

Incompatibles: Atropine, morphine, tannin, caustic alkalies, ferric and metallic salts.

Synergists: Aconite, veratrum viride, gelsemium, sarsaparilla, spirit of nitrous ether, and drugs which paralyze the vaso-motor system.

Allied Plants:

1. *P. microphy'llus.* 2. *P. grandiflo'rus.* 3. *P. pauciflo'rus.* 4. *P. heterophy'llus.* 5. *P. spica'tus.* 6. *P. trachylo'phus;* all produce leaves of similar medicinal value.

BUCHU. BUCHU.

Barosma { **betulina,** (*Thunberg*) *Bartling et Wendland,*
crenulata, (*Linné*) *Hooker.* } The leaves.

Habitat. S. Africa, Cape Colony (Cape of Good Hope, Cape Town), mountains.

Syn. Bookoo, Buku, Bucku, Bucco. Br. Buchu Folia, Folia Bucco, Diosmæ or Barosmæ. Fr. Feuilles de Bucco (Booko, Buchu). Ger. Bucku or Buccoblätter.

Ba-ros'ma. L. fr. Gr. *βαρύς*, heavy, + *ὀσμή*, odor; *i. e.*, its powerful smell.

Bet-u-li'na. L. *betulinus*, fr. Celtic *betu*, their name for birch; *i. e.*, leaves resembling birch leaves.

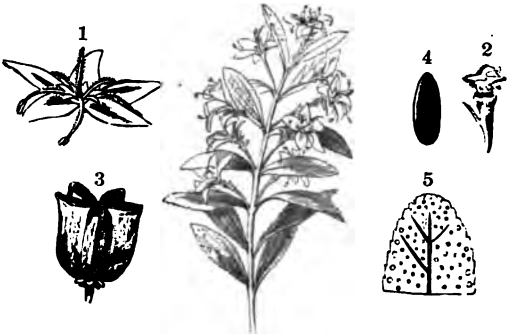
Cren-u-la'ta. L. *crenulatus*, *crena*, notched, notch; *i. e.*, leaves crenulate.

Buchu (bu'ku). African plant name; *Diosma*, old name, meaning "divine odor."

Plants.—Small bushes .3–1.2 M. (1–4°) high, branches stiff, angular, bark smooth, purple; young twigs covered with immersed oil-glands; flowers solitary, pink (*betulina*), white (*crenulata*); calyx 5 segments, deeply cut; petals 5, glandular-punctate; stamens 5; fruit, 5-cocci, adherent by inner margins, 9 Mm. (⅜′) long, 12 Mm. (½′)

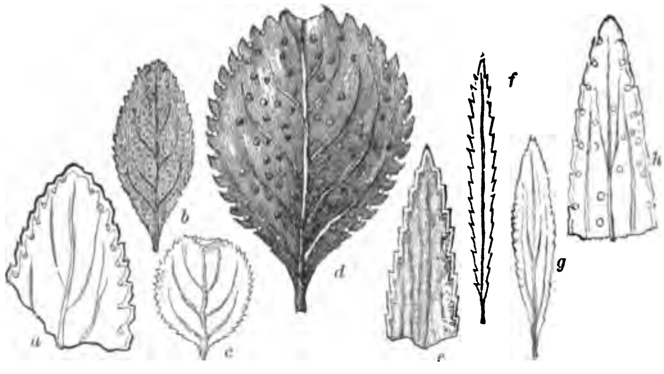
wide, 5-seeded. LEAVES. 1. *Barosma betulina.* Obovate, obtuse, 12–18 Mm. (½–¾′) long and wide, cuneate base, serrate, each serrature with an oil-gland, cartilaginous. 2. *Barosma crenulata.* Obovate, 18–30 Mm. (¾–1¼′) long, 6–12 Mm. (¼–½′) wide, crenate, underside paler, having oil-gland in each serrature, making leaves pellucid-punctate, visible when held up to light. Both kinds dull-green ; odor and taste strong, aromatic, somewhat mint-like, pungent and bitterish. *Solvents:* alcohol ; boiling water partially. Dose, gr. 15–30 (1–2 Gm.).

FIG. 213.



Barosma crenulata ; 1, calyx ; 2, style and stigma ; 3, fruit ; 4, seed ; 5, dots on leaf.

FIG. 214.



Buchu ; *a*, *b*, Barosma crenulata ; *c*, *d*, B. betulina ; *g*, *h*, B. serratifolia ; *e*, *f*, Empleurum serrulatum *b*, *c*, *f*, *g*, natural size.

ADULTERATIONS.—With leaves, branchlets, flowers, and non-aromatic capsules of allied species, also with leaves of *Empleu′rum serrula′tum.*

Commercial.—Have two market varieties: 1. *Short buchu*, which comes from the two official species. 2. *Long buchu* (*B. serratifolia*), linear-lanceolate, 3–4 Cm. (1¼–1¾′) long, 6 Mm. (¼′) wide, thinner, obtuse, tapers toward each end, mid-rib prominent, with four parallel veins ; contains less active constituent (vol. oil 0.66 p. c.).

CONSTITUENTS.—Volatile oil 1–1.6 p. c., resin, mucilage, bitter principle (rutin, barosmin); gum, salts, ash 4–5 p. c.

Volatile Oil, $C_{10}H_{16}O$.—This gives the medical properties, and is obtained by distillation and rectifying over sodium; sp. gr. 0.969, contains some $C_{10}H_{18}O$ (a body having peppermint-like odor), and upon cooling separates barosma camphor, or diosphenol, $C_{10}H_{16}O_2$, a stearopten occurring in white needle-like crystals, blackish-green with ferric salts.

PREPARATIONS.—1. *Extractum Buchu Fluidum.* Fluid Extract of Buchu. (Syn., Fr. Extrait liquide de Bucco; Ger. Flüssiges Bucco-Extrakt.)

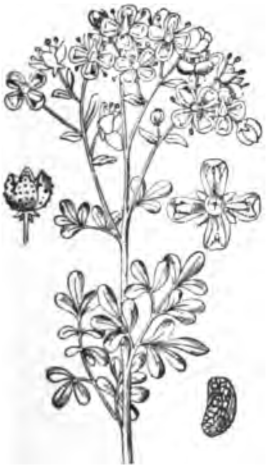
Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

Unoff. Preps.: Tincture, 20 p. c. (alcohol 60 p. c.). Dose, ʒj–2 (4–8 Cc.). *Infusion,* 5 p. c. Dose, ℥ss–2 (15–60 Cc.).

PROPERTIES.—Diuretic, tonic, stimulant, carminative, diaphoretic; increases the fluids and solids of the urine, imparting peculiar odor; acts as a tonic, astringent and disinfectant to the urinary tract, diminishing secretions. Large doses emetic, cathartic, causing burning in stomach, strangury; eliminated by the kidneys and bronchial mucous membrane.

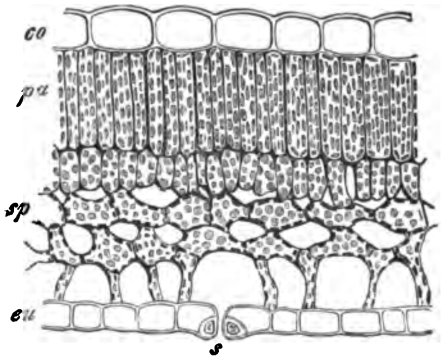
USES.—Gravel, lithemia, bladder catarrh, irritated urethra, gonorrhœa, gleet, chronic bronchitis, diseased prostate, dropsy, retention or incontinence of urine, feeble digestion, flatulency, must not give if inflammation is severe, often combined with alkalies, potassa, etc. The native Hottentots, from whom the English and Dutch physicians learned its virtues, use an ointment as vulnerary and a vinous tincture in gastric and urinary troubles; they also value it as a perfume, rubbing the powdered leaves upon their greasy bodies.

FIG. 215.



Ruta graveolens.

FIG. 216.



Buchu leaf; portion of a cross-section; *pa*, palisade cells; *sp*, spongy parenchyma; *co*, upper epidermis; *eu*, under epidermis; *s*, stomata.

Allied Plants:

1. *B. serratifo′lia*, official, 1880–1890. *B. Ecklonia′na.*—Leaves oval, 2.5 Cm. (1′) long, rounded at base, crenate, growing from pubescent shoots.

2. *Empleu′rum serrula′tum.*—Leaves longer, narrower than *B. serratifolia*, with sides parallel, apex acute and glandless.

3. *Ru′ta grave′olens.*—The leaves official, 1830–1880; S. Europe, cultivated. Plant .6–1 M. (2–3°) high, woody; flowers yellow; fruit capsule, 4–5-lobed; seeds black, many, all parts active; leaflets 12–25 Mm. (½–1′) long, 6 Mm. (¼′) wide, crenate, thick, pellucid-punctate, aromatic, bitter. Contains volatile oil (Oleum Rutæ, official, 1870–1890, greenish-yellow, aromatic), rutin (bitter, yellow glucoside). Used as stimulant, emmenagogue, and nervine, in hysteria, colic, amenorrhœa. Dose, gr. 5–20 (.3–1.2 Gm.); oil, ♏j–5 (.06–.3 Cc.).

AURANTIUM. ORANGE.

1. AURANTII AMARI CORTEX. Bitter Orange Peel.
2. OLEUM AURANTII FLORUM. Oil of (Neroli) Orange Flowers.

Citrus amara, (*Linné*) *Lyons.* } 1. The rind of the fruit. 2. Volatile
(**Citrus vulgaris,** *Risso.*) } oil, distilled from fresh flowers.

Habitat. N. India, cultivated, near the Mediterranean Sea, Spain, W. Indies, Madeira, China, S. and S. W. United States, Florida, California, etc.

Syn. 1. Curaçoa Orange, Aurantii pericarpium, Cortex Pomorum Aurantii. Fr. Écorce (Zestes) d'Oranges amères, Écorce de Bigarade. Ger. Pomeranzenschale. 2. Oil of Neroli, Oleum (florum naphæ) Neroli. Fr. Huile de Fleurs d'Orange, Essence de Néroli. Ger. Pomeranzenblüthenöl, Neroliöl.

Cit′rus. L. fr. Gr. *κίτριων*, after the town of Citron in Judea, where it formerly flourished.

A-ma′ra. L. *amarus*, bitter; *i. e.*, the decided bitter taste of the fruit.

Vul-ga′ris. L. ordinary, common; *i. e.*, kind most universal.

Au-ran′ti-um. L. *aurum*, gold; *i. e.*, yellow color of fruit.

O′range. Eng. fr. Skr. *nagarange* through the Arab. *naranj.*

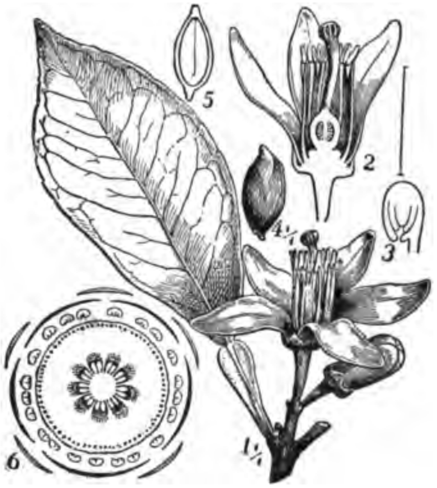
PLANT.—Small tree 3–4.6 M. (10–15°) high; stem branched; bark shining, smooth, greenish-brown; leaves 7.5–10 Cm. (3–4′) long, ovate, evergreen, faintly serrate, with oil-vesicles, fragrant, petioles 12–25 Mm. (½–1′) long; flowers May, 2.5 Cm. (1′) broad, white; fruit 5–10 Cm. (2–4′) in diameter, round, red or yellow, 9–11-celled, each several-seeded. RIND (zest), in narrow, thin bands or quarters, epidermis dark-brownish-green, glandular, with very little spongy, white, inner layer adhering; odor fragrant; taste bitter and aromatic. *Solvents:* alcohol; water. Dose, gr. 15–30 (1–2 Gm.). OIL, yellowish liquid, fragrant odor, aromatic bitter taste, sp. gr. 0.880, soluble in equal volumes alcohol, the solution neutral. *Test:* Strong solution sodium bisulphite gives purplish-red color. *Solvents:* alcohol; water very slightly.

SUBSTITUTIONS.—Various parts of the tree are used in medicine; the leaves (bitter, aromatic) and dried flowers chiefly, both can be given in infusion as stimulant, diaphoretic. The oil is sometimes mixed with that coming from leaves, imperfect flowers, unripe fruit, etc.

Commercial.—This bitter fruit mostly grows in Spain, Madeira, India, China, being known as Seville or Bigarade Orange. The Mandarin (*C. sine'nsis*), S. Europe, has pleasant taste, but is much smaller, also flattened at both ends, and has very thin rind. The celebrated Bizarria, of Italy, produces on the same stem, oranges, lemons, and citrons, and these often in mixed parts.

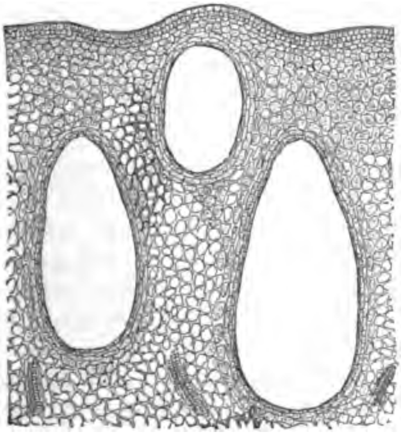
The oil is distilled from the fresh flowers when it floats upon the water, and can be easily separated; of this there are four commercial grades: 1. *Néroli* (*Essence de*) *Pétale*, most delicate, from flowers of *C. Aurantium.* 2. *Néroli* (*Essence de*) *Bigarade*, from flowers of *C. amara* (*Bigaradia*), U. S. P. 3. *Néroli* (*Essence de*) *Portugal*, from immature fruits of *C. Aurantium.* 4. *Néroli* (*Essence de*) *Petit Grain*, from immature fruits and leaves of *C. amara.* Comes mostly from Grasse, Cannes, Messina, Nice.

FIG. 217.



Citrus amara (vulgaris); 1, the end of a flowering twig; 2, flower, vertical section; 3, longitudinal section of ovary; 4, seed; 5, longitudinal section of seed; 6, diagram of flower.

FIG. 218.



Orange peel; transverse section, magnified 65 diam.

CONSTITUENTS. — I. RIND: Volatile oil (*official*, hesperidin, fixed oil, resin, gum, tannin, ash 4–5 p. c.). II. OIL: Limonene 20 p. c., nerolol, $C_{10}H_{18}O$, 30 p. c., nerolyl acetate 40 p. c., geraniol, $C_{10}H_{18}O$, 3 p. c.

PREPARATIONS. — I. RIND: 1. *Extractum Aurantii Amari Fluidum.* Fluid Extract of Bitter Orange Peel. (Syn., Fr. Extrait liquide d'Écorce d'Orange amère; Ger. Flüssiges Pomeranzenschale-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

2. *Tinctura Aurantii Amari.* Tincture of Bitter Orange Peel. (Syn., Br. Tinctura Aurantii; Fr. Teinture d'Écorce d'Oranges amères; Ger. Pomeranzenschalentinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm., with alcohol 60 p. c., q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

3. *Tinctura Cinchonæ Composita*, 8 p. c. Dose, ʒj–4 (4–15 Cc.).

4. *Tinctura Gentianæ Composita*, 4 p. c. Dose, ʒj–4 (4–15 Cc.).

II. Oil: 1. *Aqua Aurantii Florum Fortior.* Stronger Orange Flower Water. (Syn., Aqua Aurantii Florum, Triple Orange Flower Water.)

Manufacture: Obtained as a by-product in distilling oil of orange flowers, but can be made by collecting three parts of distillate from two of flowers. Keep dark and loosely-stoppered.

2. *Aqua Aurantii Florum.* Orange Flower Water. (Syn., Aqua Florum Naphæ; Fr. Eau (Hydrolat.) distillée de Fleurs d'Oranger, Eau de Naphe; Ger. Orangenblüthenwasser.)

Manufacture: By mixing equal volumes of stronger orange flower water and distilled water.

Prep.: 1. *Syrupus Aurantii Florum.* Syrup of Orange Flowers. (Syn., Fr. Sirop de Fleurs d'Oranges; Ger. Pomeranzenblüthensirup.)

Manufacture: Dissolve sugar 85 Gm. in orange flower water 45 Cc., adding the latter q. s. 100 Cc. Dose, *ad libitum;* as a flavoring vehicle.

Properties.—Stimulant, tonic, carminative, stomachic, bitter; excessive doses of both peel and oil cause colic, convulsions, occasionally death.

Uses.—In indigestion, flatulence, corrigent to purgatives; aromatic when in combination with gentian, calumba, quassia, cinchona, etc.; most of the preparations are used as flavoring agents. Workmen employed among the fruit have skin eruptions, nervousness, headache, gastralgia, insomnia, muscular spasms.

AURANTII DULCIS CORTEX. SWEET ORANGE PEEL.

Citrus Aurantium, *Linné.* } The rind of the fresh fruit.

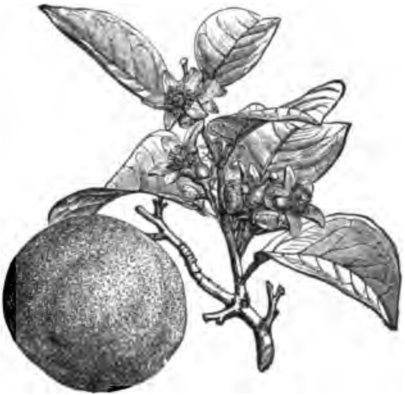
Habitat. Same as *C. amara* (*vulgaris*).

Syn. Curaçao, Navel (Seedless) Orange, Forbidden Fruit, Golden (Orange) Apple, Nerotia Flowers. Fr. Écorce (Zestes) d'Oranges douces. Ger. Apfelsinenschalen.

Plant.—Small tree 4.5–6 M. (15–20°) high, identical with *C. amara*, only differing in point of variety. This has leaves and flowers more fragrant, also fruit larger, sweeter, deeper-yellow. Rind, similar to preceding, orange-yellow color, odor sweetish, fragrant, taste aromatic, slightly bitter. *Solvents:* alcohol; water. Dose, gr. 15–30 (1–2 Gm.).

Commercial.—This sweet fruit does not grow wild, but only by cultivation. Was unknown to the Greeks and Romans, being first introduced into Europe by the Portuguese in the fifteenth century. There are now some fifty varieties cultivated in Spain, Portugal, Madeira. Azores, China, West Indies, S. and S. W. United States, many of which have been given commercial names after the districts of production, as China, Portugal, Havana, Florida, California, Messina and Malta (blood-red). These are imported in boxes of 100–200, having each orange wrapped in tissue-paper; to us the sweetest come from Havana, Florida, and California.

FIG. 219.



Citrus Aurantium.

CONSTITUENTS.—Volatile oil (*official*), hesperidin, (fixed oil, resin, gum, tannin, ash 4–5 p. c.).

PREPARATIONS.—1. *Syrupus Aurantii.* Syrup of Orange. (Syn., Syrup of Orange Peel; Fr. Sirop d'Écorce d'Orange; Ger. Pomeranzen (Orangen)-schalensirup.)

Manufacture: Boil orange peel 5 Gm. with alcohol 10 Cc., filter into sugar 15 Gm. + precipitated calcium phosphate 5, triturate, adding water 30 Cc., filter, add sugar 55, and water q. s. 100 Cc. Dose, *ad libitum;* as a flavoring vehicle.

2. *Tinctura Aurantii Dulcis.* Tincture of Sweet Orange Peel. (Syn., Fr. Teinture d'Orange douce; Ger. Apfelsinenschalentinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.), for flavoring.

PROPERTIES AND USES.—Aromatic, solely for flavoring; fruit edible.

OLEUM AURANTII CORTICIS. OIL OF ORANGE PEEL.

Citrus { **amara,** (*Linné*) *Lyons,*
Aurantium, *Linné.* } A volatile oil, obtained by expressing the fresh peel (of scarcely ripe fruit) of either species.

Syn. Essential Oil of Orange Peel. Fr. Huile d'Orange. Ger. Pomeranzenschalenöl.

This oil can also be secured by rupturing the oil-glands of the rind, and sponging up exuding oil, or by the *écuelle* process, or by distillation, when we get a less fragrant product. It is a pale-yellowish liquid, of characteristic orange odor, aromatic, and when from *C. amara* somewhat bitter taste; sp. gr. 0.850, soluble in 4 volumes alcohol. *Test:* When old should not have terebinthinate odor or taste (abs. oil of turpentine and other oils containing pinene). Oil from *C. amara* is confusingly known commercially also as *Essence de Bigarade*, and is the most valuable; while that from *C. Aurantium* is often termed *Essence de Portugal.* Both are shipped in tinned-copper cans. Dose, ♏j–5 (.06–.3 Cc.).

CONSTITUENTS.—Hesperidene (citrene, limonene), $C_{10}H_{16}$, with some geranial (citral), $C_{10}H_{16}O$, and a lower boiling aldehyde.

PREPARATIONS.—1. *Spiritus Aurantii.* Spirit of Orange. (Syn., Fr. Esprit (alcolat) d'Huile d'Orange; Ger. Pomeranzengeist.)

Manufacture: 5 p. c. Dissolve oil 5 Cc. in deodorized alcohol 95 Cc. As a flavoring vehicle.

2. *Spiritus Aurantii Compositus.* Compound Spirit of Orange.

(Syn., Fr. Esprit d'Orange composée; Ger. Zusammengesetzter Orangengeist.)

Manufacture: 20 p. c. Dissolve oil 20 Cc., + oil of lemon 5, oil of coriander 2, oil of anise .5, in deodorized alcohol q. s. 100 Cc. As a flavoring vehicle.

Prep.: 1. *Elixir Aromaticum.* Aromatic Elixir. (Syn., Simple Elixir; Fr. Elixir Aromatique; Ger. Aromatisches Elixir.)

Manufacture: $1\frac{1}{5}$ p. c. Dissolve compound spirit of orange 1.2 Cc. in deodorized alcohol 25 Cc., to this add syrup 37.5, precipitated calcium phosphate 1.5 Gm., water q. s. 100 Cc., agitate, filter. As a flavoring vehicle.

3. *Spiritus Myrciæ,* $\frac{1}{20}$ p. c. Used externally.

PROPERTIES AND USES.—Aromatic; mainly for flavoring and in perfumery.

LIMON. LEMON.

1. LIMONIS CORTEX. Lemon Peel.
2. LIMONIS SUCCUS. Lemon Juice.

Citrus Limon(i)um, *Risso*. } 1. The rind of the recent fruit. 2. The freshly expressed juice of the ripe fruit.

Habitat. N. India (cultivated in subtropics, Mediterranean Basin, United States (Cal., Fla.), Australia, etc.

Syn. Fr. Limon, Citron. Ger. Limone, Citrone.

Li-mo'n(i)-um. L. for lemon. Arab *limun* or *limu,* taken from Skr. *nimbuka.*

PLANT.—Straggling bush or tree, 3–4.5 M. (10–15°) high, more tender than the orange, having many angular branches and sharp spines in the leaf axils; bark gray, that of branches green, of twigs reddish or purple; leaves evergreen, 5–6 Cm. (2–2½′) long, ovate, acute, serrate, 12 Mm. (½′) petioles; flowers all the year round, sweet-scented, white to purplish-pink; fruit ovoid berry 7.5 Cm. (3′) long with nipple-shaped extremity, smooth, depressed punctations over the oil-glands, structure like orange; pulp acid, yellow; seeds as in orange, only smaller. PEEL, in narrow, thin bands, with some of the spongy, white, inner layer adhering; externally deep-yellow, ruggedly glandular; fragrant odor; aromatic, bitter taste. The inner spongy portion should always be removed and not used. *Solvents:* alcohol; wine; water. Dose, ʒss-1 (2–4 Gm.). JUICE, slightly turbid, yellowish liquid, lemon odor due to accidental presence of rind's volatile oil; taste acrid, often bitterish; sp. gr. 1.030, acidity due to 7 p. c. citric acid; ash about ½ p. c.; yield ½–1 oz. (15–30 Cc.) per lemon. Dose, ʒij–5 (8–20 Cc.).

Commercial.—Lemons reach us from Florida, California, W. Indies, Mediterranean region, Sicily, Spain, packed in chests, each one being wrapped in white or brownish tissue-paper. The foreign varieties are known as *wax, imperial, gæta.* When kept several months the citric acid decomposes into sugar and carbonic acid, consequently to insure preservation, they can be coated with melted paraffin, dissolved shellac, or varnish, thus allowing long shipments. The rind should be pared thinly from the fruit with sharp knives, then dried. The juice is best rendered by softening the fruit with hands, dividing in halves, pressing with squeezers and straining.

CONSTITUENTS.—I. PEEL: Volatile oil, hesperidin, ash 4 p. c.

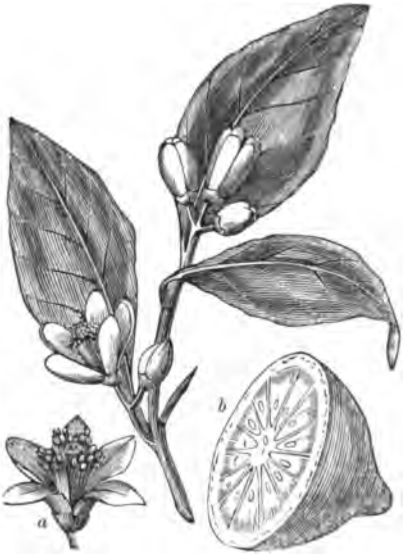
Oleum Limonis. Oil of Lemon, *official.*—(Syn., Oleum de Cedro; Fr. Essence (Huile) de Citron—Cédrat; Ger. Citronenöl, Limonenöl.)

This volatile oil is manufactured mostly in S. France and Italy, being obtained by expression from fresh lemon-peel; it is a pale-yellow, limpid liquid, of fragrant lemon-odor, aromatic, bitter taste, sp. gr. 0.858, soluble in 3 volumes alcohol, in all proportions absolute alcohol or glacial acetic acid. Contains chiefly citrene or limonene, $C_{10}H_{16}$, 76 p. c., citral, $C_{10}H_{16}O$, 7–8 p. c. (this latter gives the aroma and value, and may also be produced by oxidizing geraniol, $C_{10}H_{18}O$, with chromic acid), little cymene, $C_{10}H_{14}$, and citronellal; should not by age become terebinthinate in odor or taste (abs. oil turpentine and other pinene oils); should be kept in cool, dark place in well-stoppered bottles.

ADULTERATIONS. — Oils of other *Citrus* fruits, fixed oils, alcohol, oil of turpentine. The fragrant *Oil of Petit Grain Citronnier*, from immature fruits, leaves and twigs closely resembles *Néroli Petit Grain*, and can be used similarly.

Hesperidin, $C_{22}H_{26}O_{12}$. — A glucoside (bitter principle) from the white, spongy part or rind by boiling water; bitter, yellowish-white powder or white needles; soluble in dilute alkalies or acetic acid, black with ferric salts, and by diluted sulphuric acid decomposed into hesperetin, $C_{16}H_{14}O_6$, and glucose, $C_6H_{12}O_6$.

FIG. 220.



Citrus Limon(i)um; *a*, flower; *b*, fruit.

II. JUICE: Citric acid 7–10 p. c., malic acid, gum, sugar ½–1 p. c., ash ½ p. c. (= K 45, Ca 8, H_3PO_4 7–15 p. c.).

Acidum Citricum. Citric Acid, $H_3C_6H_5O_7 + H_2O$, *official.*—A 7 p. c. solution of this acid in water with $\frac{1}{5}$ p. c. oil of lemon resembles closely lemon-juice in strength, can be substituted for it and like it undergoes decomposition, becoming mouldy, forming acetic acid and other products.

PREPARATIONS.—I. PEEL: 1. *Spiritus Limonis.* Spirit of Lemon (Essence of Lemon). (Syn., Fr. Alcolat (Esprit) de Citron; Ger. Citronenessenze.)

Manufacture: 5 p. c. Macerate 5 Gm. + oil of lemon 5 Cc. with deodorized alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

II. OIL: 1. *Spiritus Limonis*, 5 p. c.; see above.

2. *Spiritus Aurantii Compositus*, 5 p. c. Dose, ʒss–2 (2–8 Cc.).

3. *Spiritus Ammoniæ Aromaticus*, 1 p. c. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: I. PEEL: *Syrup. Infusion.* II. JUICE: *Syrup.*

The juice is mostly used alone or neutralized by alkali; soon spoils, but will keep a short time by letting stand to coagulate albumin; straining into hot bottles, and coating top with almond or sweet oil; the flavor is best preserved by making concentrated syrup.

PROPERTIES AND USES.—1. PEEL: Stimulant, stomachic; added usually to infusions, tinctures, etc., chiefly for flavoring.

II. JUICE: Refrigerant, relieves thirst, febrile inflammatory affections in agreeable beverages. Diaphoretic (as neutral mixture), scurvy (seamen on long voyages should take ℥j (30 Cc.) daily as a preventive), acute rheumatism. Locally in sunburn, pruritus of scrotum, uterine hemorrhage after labor, gargle in diphtheria.

Limones, Lemons. The fruit, official, 1830–1860.

Allied Plant:

1. *Æ′gle Ma′rmelos, Bela, Bael, Bengal Quince.*—Malabar, Coromandel, cultivated in India. Fruit round, size of a large orange, cherry-red color, pulp firm, brittle, 12-celled, covered with hard, woody, nearly smooth rind. The dried half-ripe fruit is used, which is sometimes adulterated with fruit of *Garci′nia Mangosta′na, Mangosteen.* Contains mucilage, pectin, sugar, tannin, bitter principle, volatile oil. It is mildly astringent. Dose, gr. 15–30 (1–2 Gm.), in diarrhœa, dysentery.

BERGAMOTTA. BERGAMOT.

Oleum Bergamottæ. **Oil of Bergamot** (Oleum Bergamii), *official.*

Citrus Bergamia, *Risso et Poiteau.* } A volatile oil, obtained by expression from rind of the fresh fruit.

Habitat. S. Italy, France, Jamaica, Sicily, near Reggio in S. Calabria; cultivated.

Syn. Bergamot Lemon or Orange, Adam's Apple, Essence of Bergamot. Fr. Essence (Huile) de Bergamotte. Ger. Bergamottöl.

Ber-ga′mi-a. L. fr. It. *bergamotta*, from fruit resembling the pear of same name, originally from the Italian town Bergamo.

PLANT.—Small tree resembling the lemon, orange, and others of same genus—in fact, formerly considered *C. Aurantium* var. *Bergamia;* by cultivation it yields smaller flowers of a delicious peculiar odor, and paler-colored fruit; fruit pyriform or globose, 5–7.5 Cm. (2–3′) thick, smooth, lemon-color, with concave receptacles (of oil) in the rind, excepting that at the apex; pulp greenish, sourish, aromatic, not disagreeable.

CONSTITUENTS.—RIND: Volatile oil, hesperidin, ash.

Oleum Bergamottæ. Oil of Bergamot.—This is obtained by collecting fruit in November–December, when full grown, but still greenish and unripe; the outer rind can be subjected to expression, distillation, sponge process, or, preferably, to the *écuelle* (*à piquer*) process. This instrument is bowl-shaped, 25 Cm. (10′) wide, of tinned-copper, having a raised opening in the center which forms with the outer edge a broad channel; to this there is a heavy cover similarly shaped, whose inner surface as well as that of the machine is armed with concentric rows of short (6 Mm.; ¼′) spikes or ridges; an opening in the bottom allows the escape of oil. By a handle the cover is made to revolve rapidly one-half minute over the instrument, having between the two 6 to 8 fruits, after which they are replaced by fresh ones. About 7,000 fruits can be exhausted daily by each machine, and every 100 yield 2½–3 ozs. (75–90 Cc.) of oil. It is a greenish, thin liquid, of peculiar fragrant odor, aromatic, bitter taste; sp. gr. 0.880–0.885, soluble in alcohol and glacial acetic acid. Contains the terpenes, limonene (citrene), $C_{10}H_{16}$, dipentene (bergaptene or bergamot camphor), $C_9H_6O_3$ (greasy or waxy solid deposited from freshly expressed oil; when fused with potassa gives phloroglucin), also an alcohol, linalool, $C_{10}H_{17}OH$, and an ester, linalool acetate (bergamiol), $C_{10}H_{17}C_2H_3O_2$, 36–39 p. c.; upon this latter the value chiefly depends. *Tests:* 1. 2 volumes oil + 1 volume alcohol gives clear solution not turbid by additional alcohol; also clear solution in liquor potassæ (dif. from lemon and orange oils). 2. When evaporated should have soft green residue of not more than 6 p. c. (abs. of fatty oils).

ADULTERATIONS.—Oil from leaves and nearly exhausted rind, oil of orange and turpentine, alcohol.

PROPERTIES AND USES.—Stimulant, excitant, aromatic. Used exclusively as a perfume.

Allied Plant:

1. *Citrus me′dica, Citron.*—Small tree, but fruit very large, 20–22.5 Cm. (8–9′) long, resembling pineapple in shape. The rind is popular as a dessert; essence in perfumery, and juice for similar purposes as that of lemon and lime fruits.

48. SIMARUBACEÆ. Quassia Family.

Sim-a-ru-ba′se-e. L. *Simarub-a* + aceæ; from native name in Guiana. Shrubs, trees. Distinguished by containing bitter principle, and from allied Rutaceæ, by leaves being exstipulate, without glands or dots, alternate; ovary stalked, 4–5-lobed, superior; ovules 1 in each cell; stamens 8–10, augmented each by one or more scales; calyx 4–5; petals 4–5; fruit drupe; seed exalbuminous; tropics; bitter, tonic, febrifuge.

Genus : 1. **Picrasma.**

QUASSIA. QUASSIA.

Picrasma excelsa, (*Swartz*) *Planch.* } The wood.

Habitat. W. Indies (Jamaica, St. Kitt's, Antigua, St. Vincent).

Syn. Bitter Ash—Bark—Quassia or Wood, Lofty Quassia. Br. Quassiæ Lignum. Fr. Bois(amer) de Quassie. Ger. Quassienholz.

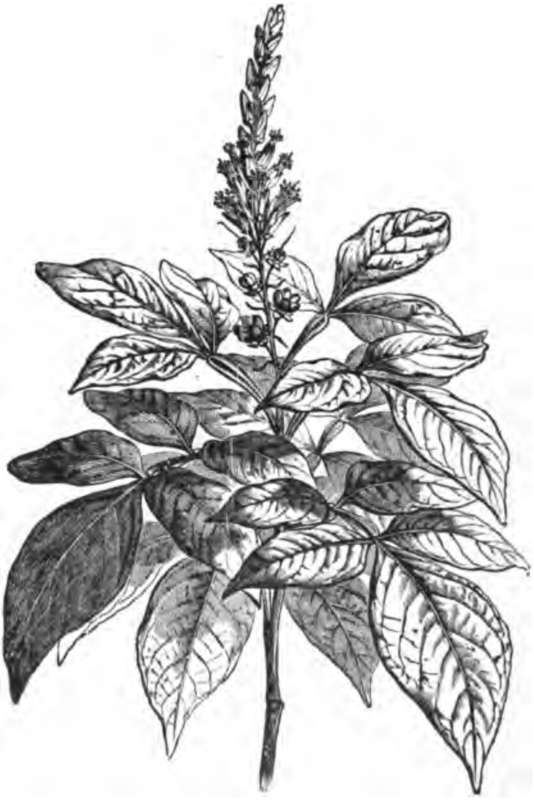
Pic-ras'ma. L. fr. Gr. *πικρός*, bitter ; *i. e.*, the plant's chief property.

Ex-cel'sa. L. *excelsus*, *ex*, out, + *celsus*, beyond, surpassing ; *i. e.*, highest species of the genus.

Quas'si-a. L. fr. *Quassi*, *Quassy*, *Quash*, name of Surinam negro slave who used bark as a secret remedy in curing malignant fevers (febrifuge).

PLANT.—Tree 15–24 M. (50–80°) high, .6–1 M. (2–3°) thick, erect, spreading, resembles our common ash ; bark brownish-gray, smooth, wrinkled ; leaves imparipinnate, 4–5 pairs ; leaflets 5–10 Cm. (2–4') long, ovate, petiolate, when young covered with fulvous down ; flowers Oct.–Nov. small, yellowish-green, panicles, polygamous ; fruit Dec.–

FIG. 221.



Picrasma excelsa.

Jan., black drupe, size of pea. WOOD, imported in billets, logs, 1–2 M. (3–6°) long, 5–50 Cm. (2–20′) thick, dense, tough, hard, porous, minute pith, narrow medullary rays (in shops as chips, raspings), yellowish-white; inodorous; very bitter. *Solvents:* water; diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—With wood and bark of allied species. Its bitterness and absence of tannin (iron test) serve to distinguish it from other likely admixtures.

Commercial.—The tree, also named *Quassia excelsa, Simaruba excelsa,* is felled, cut into segments, and shipped from Jamaica, with or without the bark. The wood at first is white, but turns yellow by age. Upon reaching this country it is turned into quassia cups, etc.; the shavings being reserved for store use. The slave Quassi became celebrated for treating fevers, and was prevailed upon to reveal his secret for compensation, in 1756, when it was taken to Stockholm, soon to become popular in Europe and elsewhere; this was *Quassia amara.*

CONSTITUENTS.—Picrasmin (quassin) 0.05–0.15 p. c., alkaloid (fluorescent in acidified alcoholic solution), resin, mucilage, pectin.

Picrasmin.—Obtained by neutralizing the infusion with soda, precipitating with tannin, decomposing precipitate by heating with lead oxide or lime and dissolving out with alcohol. It is a mixture of crystalline compounds ($C_{35}H_{46}O_{10} + C_{36}H_{48}O_{10}$), homologous with quassin, $C_{32}H_{40}O_{10}$, of Surinam quassia, very bitter, soluble in hot alcohol, chloroform, slowly in water. Dose, (amorphous) gr. $\frac{1}{2}$–1 (.03–.06 Gm.); (crystalline) gr. $\frac{1}{32}$–$\frac{1}{8}$ (.002–.02 Gm.).

PREPARATIONS.—1. *Extractum Quassiæ.* Extract of Quassia. (Syn., Fr. Extrait de Quassie (Bois amer); Ger. Quassia-Extrakt.)

Manufacture: Percolate 100 Gm. with water until exhausted, evaporate. Dose, gr. 1–3 (.06–.2 Gm.).

2. *Extractum Quassiæ Fluidum.* Fluid Extract of Quassia. (Syn., Fr. Extrait liquide de Quassie; Ger. Flüssiges Quassia-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 35 p. c., q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

3. *Tinctura Quassiæ.* Tincture of Quassia. (Syn., Fr. Teinture de Quassie (amère); Ger. Quassia-Tinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with alcohol 35 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Infusion, 2 p. c. Dose, ℥j–2 (30–60 Cc.). *Syrup,* for fly poison.

PROPERTIES.—Tonic, febrifuge, anthelmintic, simple bitter (similar to calumba).

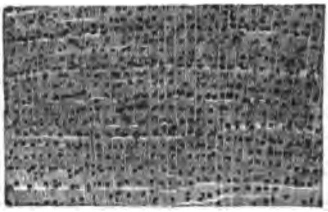
USES.—Atonic dyspepsia, diarrhœa, gastric vertigo, constipation, lost appetite, poisons flies (*papier mouri*), fish, dogs, rabbits. Infusion (℥viij; 240 Cc.), patient being in the knee-chest position, as enema for thread worms (*Oxyuris vermicularis*) or ascarides of rectum, internally for lumbricoid worms. Large doses cause headache, nausea, vertigo, vomiting, diarrhœa, cramps, narcosis. Substituted for hops in making beer and ale.

Allied Plants:

1. *Qua'ssia ama'ra, Surinam Quassia Wood.*—Comes in billets 2.5–10 Cm. (1–4′) thick; much used in Europe. Was the original quassia, but owing to the tree's smallness (thus limiting supply) and the great demand, it has been replaced by the much larger official tree.

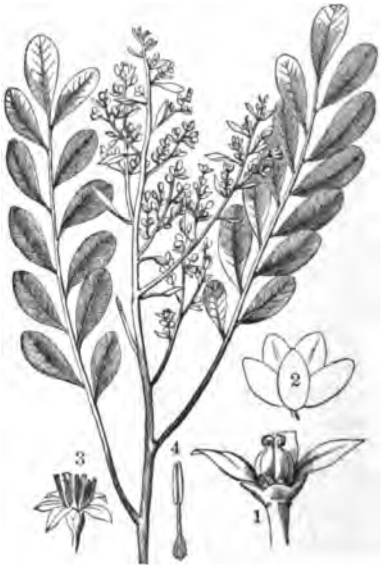
2. *Simaru'ba ama'ra* (*S. officina'lis*, *S. medicinalis*, *Qua'ssia Simaru'ba*).—The bark (of root) official, 1820–1880; Guiana to N. Brazil, W. Indies. Tree 15–18 M. (50–60°) high, crooked branches; leaves 22.5–30 Cm. (9–12′) long, leaflets 3–5 pairs, 5–10 Cm. (2–4′) long; flowers yellow; fruit drupes; bark flat, curved or quilled, .5–1 M. (20–40′) long, 3 Mm. (⅛′) thick, yellowish-brown, striate, fibrous, bitter. Contains picrasmin, resin, volatile oil, calcium oxalate; used as tonic, febrifuge, diuretic (large doses cause vomiting and purging), for dysentery, diarrhœa (*dysentery bark*), etc.; in infusion, decoction. Dose, gr. 10–30 (.6–2 Gm.).

FIG. 222.



Jamaica quassia wood; cross-section, magnified three diam.

FIG. 223.



Simaruba amara (officinalis): 1, calyx and ovary; 2, corolla; 3, stamens; 4, stamen and anther.

3. *Sima'ba ce'dron* and *S. ferrugi'nea.*—Colombia, Brazil; resembles simaruba, but flowers hermaphrodite; fruit pear-shape, size of hen's egg; used natively as febrifuge and as antidote to poisonous animal bites.

4. *Me'lia Aze'darach, Margosa Bark, Pride of India.*—Meliaceæ. The bark of the root official, 1820–1890, China, India, cultivated, S. United States. Beautiful tree 9–12 M. (30–40°) high, leaves imparipinnate; flowers lilac-color; fruit drupe, yellow, size of cherries, poisonous pulp; never leafless. Bark curved or quilled, 5–7.5 Cm. (2–3′)

long, 5 Mm. ($\frac{1}{5}$′) thick; outer surface reddish with irregular blackish ridges; inner surface whitish or brownish, striate, sweet, bitter, nauseous. Contains resin; used for lumbricoid worms, emetic. Dose, gr. 15–60 (1–4 Gm.), in decoction, tincture (diluted alcohol).

5. *Sycoca′rpus Ru′sbyi, Cocillana.*—Meliaceæ. Bolivia. Bark thick, ash-colored, rough by age, inner surface grayish-yellow, odor slight, peculiar, taste unpleasant, nauseous. Contains rusbyine, two alkaloids, tannin, calcium oxalate. Expectorant (better than ipecac), laxative, emetic; bronchitis, bronchial pneumonia, phthisis. Dose, gr. 5–20 (.3–1.3 Gm.).

49. BURSERACEÆ (AMYRIDACEÆ). Myrrh (Frankincense) Family.

Ber-se-ra′se-e. L. *Burser-a* + aceæ, after Joachim Burser, German botanist, at Naples, 17th century. Trees or shrubs. Distinguished by secreting fragrant gum-resinous or resinous juice; leaves compound, dotted; ovary sessile, 1–5-celled, ovules in pairs; flowers perfect; calyx 2–5 divisions; petals 3–5; stamens twice the petals; fruit dry, 1–5-celled; seed exalbuminous, superior; tropics; bitter, purgative, anthelmintic, poisonous; lumber.

Genus: 1. **Commiphora.**

MYRRHA. MYRRH.

Commiphora Myrrha, (*Nees*) *Engler.* } A gum-resin.

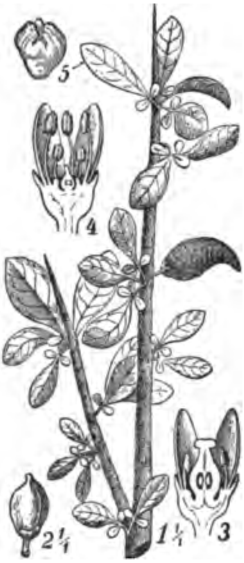
Habitat. E. Africa, S. W. Arabia, Somali country, around Hurrur.
Syn. Gummi-resina Myrrha. Fr. Myrrhe. Ger. Myrrhe.
Com-miph′o-ra. L. fr. Gr. *κόμμι*, gum, + *φόρος*, *φέρειν*, bears, to bear; *i. e.*, produces gummy exudation.
Myr′rha. L. fr. Gr. *μύρρα*, classic name, = Ar. *murr;* Heb. *mar*, bitter; *i. e.*, gum-resin has bitterish taste.

Plant.—Low, stunted bush or small tree 2.5–3 M. (8–10°) high; trunk considerable size, with many irregular, knotty, abortive branches at right angles, terminating in sharp spines; bark whitish-gray; leaves trifoliate, 2.5 Cm. (1′) long, petiolate; leaflets sessile, 12 Mm. ($\frac{1}{2}$′) long, unequal, obovate, central one the largest; flowers diœcious; fruit 12 Mm. ($\frac{1}{2}$′) long, pyriform. Gum-resin (myrrh), in roundish, irregular tears or masses, dusty, brownish, reddish; fracture waxy, splintery, translucent on edges, sometimes with whitish veins; odor balsamic; taste aromatic, bitter, acrid; triturated with water gives brownish-yellow emulsion; with alcohol brownish-yellow tincture, turning purple with nitric acid. If dark-colored tears used, we get no purple with nitric acid, hence such pieces and others which dissolve completely or simply swell in water should be rejected. *Solvent:* alcohol. Dose, gr. 5–30 (.3–2 Gm.).

Adulterations.—With gum-resin of allied species (fracture more transparent or opaque, odor and taste different), vegetable fragments, sand, salt, dark gums swelling or adhesive with water.

Commercial.—Trees form an undergrowth in the Red Sea coast forests, where vegetation is scanty, water scarce, temperature high, the favored elevation being 450–900 M. (1,500–3,000°). Myrrh is formed in the bark and pith, and exudes spontaneously as a juice through the stem-bark like cherry-tree gum; at first soft, oily, yellowish, then golden, finally hard and reddish. Mostly collected by the Somalis, both at home and across Aden Gulf in Arabia. Formerly entered commerce via Egypt and Levant ports, hence name *Turkey myrrh;* now conveyed to the great fair of Berbera, where it is purchased by Banians of India, thence shipped via Aden to Bombay; here it is assorted into grades (bdellium separated) and put into chests of 100–200 lbs. (45–90 Kg.) for market. There are several varieties, all from the same genus:

FIG. 224.



Commiphora Myrrha; 1, fruit-bearing twig; 2, ripe fruit; 3 and 4, vertical section of pistillate and staminate flowers respectively; 5, embryo.

1. *Turkey, African,* the best and is our official kind. 2. *Arabian,* cultivated in S. Arabia, east of Aden, called by Arabs *mur,* by Somalis *mulmul* or *heerabul;* resembles Turkey myrrh, but is more brittle, has no white lines in the fracture, and only 25 p. c. is soluble in alcohol. 3. *Indian, Myrrha Indica,* called natively *bissabul,* by Somalis *hebbakhade;* resembles dark myrrh, but differs in odor, resembling that of mushrooms; taste strong, almost acrid, and has many impurities.

CONSTITUENTS. — Volatile oil 4–8 p. c., Resin 25–40 p. c., Gum 40–60 p. c., bitter principle (glucoside, soluble in alcohol, water), ash 3–4 p. c. = mostly calcium carbonate.

Volatile Oil, $C_{10}H_{14}O$.—Also called *myrrhol* or *myrrhenol.* Identical in formula with thymol and carvol, but distinct from them; easily resinifies, pale-yellow, thick liquid, sp. gr. 0.980.

Resin, $C_{48}H_{32}O_{10}$. — Often called *myrrhin,* becomes acid (*myrrhic acid*) when kept fused a short time, soluble in alcohol, chloroform, ether; with fusing potassa yields *protocatechuic acid* and *pyrocatechin.*

Gum.—Two kinds, four-fifths being soluble in water, adhesive, making stable paste; one precipitated by neutral, the other by basic lead acetate.

PREPARATIONS.—1. *Tinctura Myrrhæ.* Tincture of Myrrh. (Syn., Fr. Teinture de Myrrhe; Ger. Myrrhentinktur.)

Manufacture: 20 p. c. Macerate for seven days 20 Gm. with alcohol, 80 Cc., filter, adding latter q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.); mostly used externally.

2. *Tinctura Aloes et Myrrhæ,* 10 p. c. Dose, ʒss–2 (2–8 Cc.).

3. *Pilulæ Aloes et Myrrhæ,* gr. 1 (.06 Gm.). Dose, 2–6 pills or gr. 10–30 (.6–2 Gm.).

4. *Pilulæ Rhei Compositæ*, gr. 1 (.06 Gm.). Dose, 2–5 pills.

5. *Mistura Ferri Composita*, 1.8 p. c. Dose, ℥ss–2 (15–60 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ♏v–30 (.3–2 Cc.). *Plaster.*

PROPERTIES.—Stimulant, tonic, expectorant, emmenagogue, astringent, carminative, vulnerary. Increases circulation and the number of white blood-corpuscles; it is eliminated by the genito-urinary and bronchial mucous membranes, augmenting and disinfecting their secretions. Large doses vomit, purge, decrease bronchial secretion. Locally, stimulant, disinfectant and antiseptic to mucous membranes, ulcerated surfaces, etc.

USES.—Atonic dyspepsia, amenorrhœa, anæmia, bronchial catarrh, cystitis, pharyngitis, chronic uterine and vaginal leucorrhœa. Locally, ulcerated spongy gums, diseased mucous surfaces, relaxed throat, ptyalism, ozena, unhealthy ulcers. Tincture freely diluted with water a good disinfectant gargle to ulcerated sore throat; much used in tooth powders and washes.

Allied Plants :

1. *Commi'phora* (*Balsamode'ndron*) *Opoba'lsamum, Ba'lsamum Gilleade'nse, Balm of Gilead, Mecca Gum, Indian Bdellium.*—Greenish turbid oleoresin, rosemary-odor. *C. Mu'kul* and *C. africa'na, Indian* and *African Bdellium.* Occurs in tears, yellowish-brown, dusty, translucent; resembles myrrh, but does not give purple with nitric acid. Both of these contain volatile oil, resin, gum, bitter principle.

2. *Boswe'llia Carte'rii, Olibanum, Frankincense.*—E. Africa, S. Arabia. This gum-resin exudes from incisions made in the bark; occurs in yellowish-brown tears covered with white dust; odor balsamic, terebinthinate; taste balsamic, bitter; partly soluble in alcohol; yields with water milk-white emulsion; contains volatile oil 4–7 p. c. (mostly *olibene*, $C_{10}H_{16}$), resin 56–72 p. c., gum (resembles arabin), 30 p. c., bitter principle, ash 3 p. c.; stimulant, expectorant. Dose, gr. 15–30 (1–2 Gm.), in emulsion, plaster, or fumigation.

3. *Cana'rium commu'ne, Manila Elemi, Elemi.*—Philippine Islands. The oleoresin exudes from incisions; it is soft, yellowish, granular crystalline, when cold friable; odor strong, resembling fennel and lemon, terebinthinate; taste bitter, pungent; contains volatile oil 10 p. c., amorphous resin (*breïn*) 60 p. c. (soluble in cold alcohol), crystalline resin (*amyrin*) 25 p. c., bryoidin, breïdin, elemic acid, $C_{35}H_{56}O_4$ (crystalline). Stimulant, irritant; in plaster and ointment.

50. POLYGALACEÆ. Milkwort Family.

Pol-i-ga-la'se-e. L. *Polygal-a* + aceæ, fr. Gr. πολύς, much, + γάλα, milk; *i. e.*, thought to increase lacteal secretion in female animals. Shrubs or herbs. Distinguished by bitter, acrid properties and milky roots; flowers papilionaceous; petals 3–5, more or less united; sepals 5, of which 2 anterior are lateral, larger; petaloid, forming the wings to the flowers; stamens 8, monadelphous; ovary 2–3-celled; anthers open at apex; fruit capsular; universal; bitter, acrid, tonic, stimulant; febrifuge, astringent, emetic, purgative, diuretic, sudorific, expectorant; fruit edible, saponaceous.

Genus: 1. **Polygala.**

SENEGA. SENEGA.

Polygala Senega, *Linné.* } The root.

Habitat. United States, in woods and rocky soil. Can. to S. Ca., west to Wis.

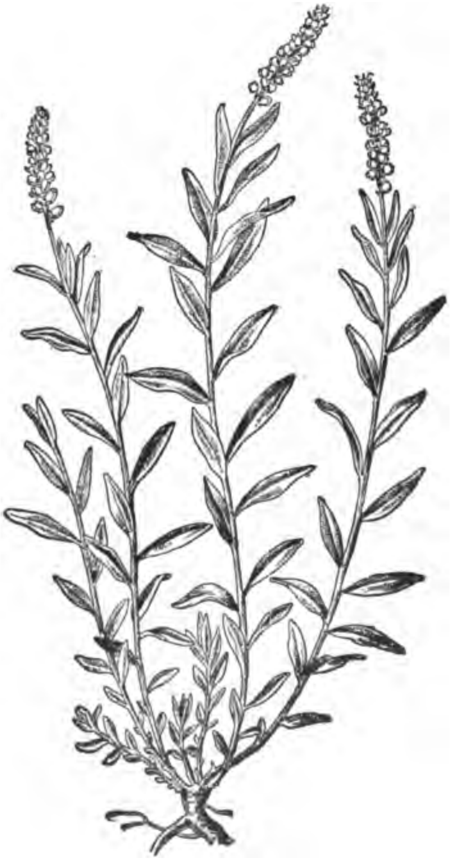
Syn. Senega Snake Root, Seneca—Seneka—or Snake Root, Milkwort, Mountain Flax. Fr. Polygala de Virginie. Ger. Senegawurzel.

Po-lyg′a-la. See etymology, page 345, of Polygalaceæ.

Sen′e-ga. L. fr. the Seneca (Senega) Tribe; one of the five N. American Indian tribes; they inhabited W. New York and used this plant as a remedy for snake-bites.

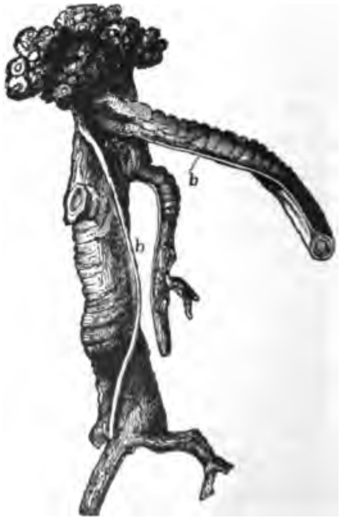
PLANT.—Perennial herb; stems several, erect, 22.5–37.5 Cm. (9–15′) high, smooth, round, leafy, occasionally reddish or purplish below, green above; leaves 2.5–5 Cm. (1–2′) long, 12 Mm. (½′) wide, lanceolate, sessile, margins rough, bright-green; flowers May–June, small, diadelphous, white, spike 2.5–5 Cm. (1–2′) long, calyx showy; sepals 5 (3 small, green; 2 larger, petaloid, called wings); corolla small, closed; fruit capsule, 2-celled, compressed, 2-seeded, black. ROOT, 10 Cm.

FIG. 225.



Polygala Senega.

FIG. 226.



Polygala Senega; root, natural size; b, b, the keel.

(4′) long, crown knotty, with spreading tortuous branches, keeled when dry, fleshy and round after soaking in water, externally yellowish-brown; bark thick, whitish within, enclosing an irregular, porous, yellowish wood; odor slight, unpleasant; taste sweet then acrid. *Solvents:* boiling water; alcohol; diluted alcohol. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Ginseng (root), gillenia, cypripedium and triosteum (rhizome + roots), American gentians (rootlets) often to 25 p. c. —resulting from careless collecting and intentional fraud. In Europe the underground portion of *Cynan′chum Vinceto′xicum* is also used; none of these has a keel, and they all differ in odor and taste.

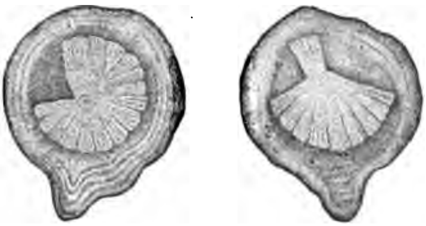
CONSTITUENTS.—Senegin 2–5 p. c., Polygalic acid, Fixed oil 8–9 p. c., Volatile oil 0.12 p. c., resin, polygalite, sugar 7 p. c., pectin and albuminoids 18.40 p. c., malates, yellow coloring-matter.

Senegin (*polygalin, saponin*), $C_{32}H_{54}O_{18}$.—Obtained by exhausting root with 60 p. c. alcohol, concentrating, precipitating with alcohol and ether; mother-liquor contains the salt of an organic acid. It is a neutral glucoside, white, amorphous, inodorous powder, insoluble in alcohol, not precipitated by normal lead acetate, and forms soapy emulsion with boiling water; by hydrochloric acid decomposed into glucose and sapogenin, $C_{14}H_{22}O_2$.

Polygalic Acid. — Sparingly soluble in alcohol, insoluble in ether; chloroform; precipitated by lead acetates.

Fixed Oil. — Obtained from root by ether; contains virgineic acid which gives disagreeable aroma.

FIG. 227.



Senega; transverse sections magnified.

Volatile Oil.—This is a mixture of valerianic ether and methyl salicylate.

PREPARATIONS.—1. *Extractum Senegæ Fluidum.* Fluid Extract of Senega. (Syn., Fr. Extrait liquide de Polygale de Virginie; Ger. Flüssiges Senega-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with ammonia water 5 Cc., alcohol 75 p. c. 95 Cc., finishing with latter q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Prep.: 1. *Syrupus Senegæ.* Syrup of Senega. (Syn., Fr. Sirop de Polygale; Ger. Senega-sirup.)

Manufacture: Mix fluid extract of senega 20 Cc. with ammonia water .5, after few hours filter, adding water q. s. 55 Cc. in which dissolve sugar 70 Gm. adding water q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

2. *Syrupus Scillæ Compositus,* 8 p. c. Dose, ♏v–60 (.3–4 Cc.).

Unoff. Preps.: Tincture, 10 p. c. Dose, ʒj–2 (4–8 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Abstract.* Dose, gr. 5–10 (.3–.6 Gm.).

Properties.—Stimulating expectorant, diuretic, diaphoretic, irritant. Produces throat and gastro-intestinal irritation, some salivation with inclination to cough, increased bronchial secretion; large doses vomit and purge. Insufflation causes sneezing, coughing and nasal catarrh. Externally, an irritant to the skin.

Senegin is a violent irritant, heart depressant, likewise same to vascular, nervous, and muscular systems. It is excreted by kidneys, skin, bronchial mucous membrane, all being stimulated and irritated by it.

Uses.—Secondary stage of acute and chronic bronchitis, in typhoid pneumonia, asthma, croup, renal dropsy, promotes expectoration; no value when mucous tough and scanty, or unless the primary acute inflammation has been subdued. Amenorrhœa, here give decoction two weeks before each menstruation, chronic rheumatism, rheumatic paralysis; senegin is given in 2 gr. (.13 Gm.) doses for uterine hemorrhage. Popular with our Indians in rattle-snake and other snake bites.

Allied Plants:

1. *Poly'gala a'lba*, *White* or *False Senega.*—West of Mississippi River; root 6 Mm. (¼′) thick, resembling official, but has a lighter color internally, also a cylindrical wood, and is destitute of keel; contains polygalic acid 3 p. c. Yields light-colored infusion and tincture. *P. Boyki'nii.* Southern States; like the *alba*, only thinner, and by some considered to be the same identical species.

2. *P. poly'gama* (*rube'lla*), *Bitter Polygala.*—The root and herb official, 1820–1880. Canada–Florida. Plant 15–22.5 Cm. (6–9′) high; leaves mucronate; flowers purple; keel crested, shorter than the wings; fruit 2-seeded, capsule oblong. Contains bitter principle analogous to senegin. Used as a tonic in bronchial catarrh; large doses laxative, diaphoretic. Similar to *P. ama'ra* of Europe.

51. EUPHORBIACEÆ. Spurge Family.

U-for-bi-a'se-e. L. *Euphorbi-a* + aceæ, Gr. *Εὔφορβος*, well fed, fr. *εὖ*, well, + *φέρβειν*, to feed, after Euphorbus, physician to Juba, king of Mauritania. Trees, shrubs, herbs. Distinguished by containing acrid, milky, poisonous juice; flowers unisexual; calyx usually wanting; corolla none; ovary superior, 3-celled, ovules 2 from each cell; fruit tricoccous, 3–6-seeded capsule; temperate climates, tropics; emetic, purgative, diuretic, rubefacient, poisonous, starchy food, caoutchouc, aromatic, tonic, dyes, wood, edible roots.

Genera: **1. Hevea. 2. Croton. 3. Ricinus. 4. Stillingia. 5. Mallotus.**

ELASTICA. INDIA RUBBER (Caoutchouc).

Hevea various species. } The prepared milk-juice, known in commerce as Para Rubber.

Habitat. S. America, India, tropics.

He-ve'a. L. fr. *hevé*, native name of tree in northern S. America.

EUPHORBIACEÆ.

E-las'ti-ca. L. *elasticus*, elastic, gummy; *i. e.*, its property.
Ca-out'chouc. S. America name, fr. *cahuchu*.

PLANTS.—There are a number which furnish this substance, but most from *H. brasilie'nsis* and *H. guiane'nsis*, which are large trees, 15–18 M. (50–60°) high; leaves trifoliate; leaflets obovate, 10 Cm. (4') long, dark-green above, lighter below; flowers in racemes. RESIN (india-rubber), occurs in cakes, balls, or hollow-shaped pieces, brownish-black; inside little lighter, very elastic, soluble in chloroform, carbon disulphide, oil of turpentine, benzin, benzene, insoluble in water, diluted acids, and alkalies; heated to 125° C. (257° F.) melts and remains soft, adhesive after cooling; odor faint, peculiar, nearly tasteless, lighter than water, heated with 10 p. c. of sulphur becomes vulcanized, insoluble in any solvents; if heated with 40 p. c. of sulphur, some tar, white lead, chalk, etc., we have hard rubber or ebonite. The milk-juice is obtained by making incisions through the bark, when it congeals in mass, or is dried upon clay moulds by frequently dipping these into the liquid and exposing to fire; when allowed to concrete on the tree it is yellowish-white; alum hastens, while ammonia retards coagulation.

SUBSTITUTIONS.—1. *H. di'scolor*, *Casti'lloa ela'stica* and *C. Markhamia'na*. S. and C. America.

2. *Fi'cus ela'stica* (so-called rubber plant of our hothouses), *F. i'ndica* and *F. religio'sa*.—E. India. All furnish an inferior caoutchouc.

3. *Urce'ola ela'stica* (Malay, climbing shrub) and *U. escule'nta* (Penang, Borneo), furnish caoutchouc as do many other plants.

CONSTITUENTS.—Resin 32 p. c., volatile oil, fat, (albumin, coloring matter).

Resin.—A solid hydrocarbon, $C_{20}H_{32}$; it is the elastic principle, known under the name of pure caoutchouc.

PREPARATIONS.—1. *Charta Sinapis*, 10 parts, + mustard 100; externally.

Unoff. Prep.: Plasters.

USES.—Woven in fabrics to reduce varicose veins, hydrocele, hernia, eczema, psoriasis, burns, ulcers, neuralgia, rheumatism, small-pox pustules. Hard rubber is used for bougies, catheters, pessaries, shields, specula, syringes, tubes, surgical instruments, etc.

CROTON TIGLIUM. CROTON OIL PLANT.

Oleum Tiglii. Croton Oil, *official.*

Croton Tiglium, *Linné.* } A fixed oil expressed from the seed.

Habitat. India, Philippine Islands (Ceylon, Borneo, Japan, Hindustan, Moluccas), cultivated.

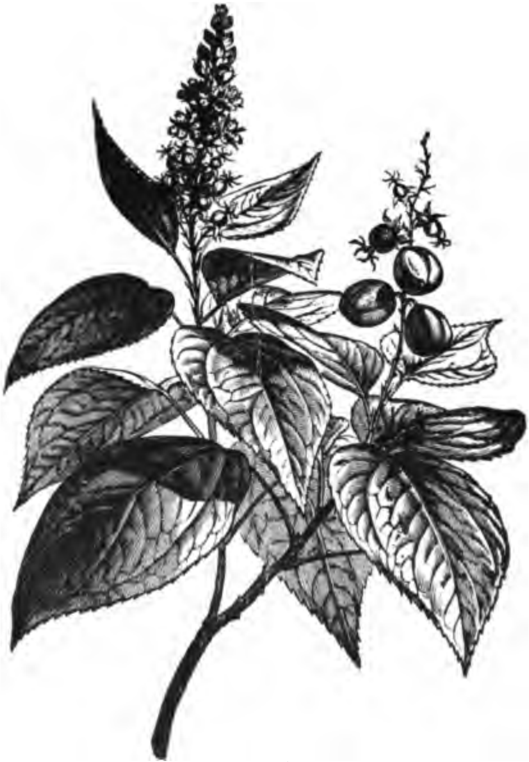
Syn. Purging Croton, Croton Seeds, Grains Tigli, Molucca Grains, Jamalgota, Jepal. Br. Oleum Crotonis. Fr. Huile de (Croton) Graines de Tilly. Ger. Crotonöl.

Cro'ton. L. fr. Gr. κροτών, dog tick; *i. e.*, from the resemblance of the seeds.

Tig'li-um. L. fr. Gr. τιλάω, to have a thin stool; *i. e.*, its medical property; croton plant seeds once called *grana tiglii* or *grana tilli*.

PLANT.—Small tree, 4.5–6 M. (15–20°) high, trunk crooked; bark smooth, light-brown, that of branches scarred from fallen leaves; leaves 10–12.5 Cm. (4–5′) long, 5 Cm. (2′) wide, glabrous, ovate, serrate, bright-green, veins prominent beneath, petioles 2.5–5 Cm. (1–2′) long; flowers monœcious, racemes—staminate at upper part—pistillate at lower, greenish-white; fruit capsule, size of hazelnut, smooth, brownish-yellow, 3-celled (tricoccous), each cell 1-seeded, dehiscent. Seeds, 12 Mm. (½′) long, 8 Mm. (⅓′) wide, ovoid, with fine raphe, testa thin, brittle, gray-brown, mottled or blackish, albumin oily; integuments 33–36 p. c., kernel 64–67 p. c.

FIG. 228.



Croton Tiglium.

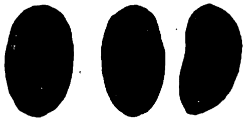
CONSTITUENTS.—Fixed oil 30–40 p. c. (from entire seeds), 50–55 p. c. (from kernels alone), proteids, albumin, etc.

Oleum Tiglii. Croton Oil.—Obtained from the seeds (deprived of shell or testa) by expression; it is a pale-yellow or brownish, viscid, fluorescent liquid, fatty odor, mild, oily, afterward acrid, burning taste (taste cautiously), congeals at – 16° C. (3.2° F.). Applied to the skin produces rubefaction or pustular eruptions, sp. gr. 0.950, reddens litmus, soluble in ether, chloroform, oil of turpentine, fixed and volatile oils, carbon disulphide; when fresh alcohol dissolves only 20 p. c., but when 3–4 years old 60 p. c. Contains glycerides of formic, acetic, isobutyric, tiglinic, $C_5H_8O_2$, valerianic, lauric, myristic, palmitic, and stearic acids, also crotonol, $C_{18}H_{28}O_4$. The purgative principle is insoluble in alcohol; the vesicating croton-resin, $C_{13}H_{18}O_4$, is soluble; this latter, along with several inactive oily acids, constitutes crotonoleic acid (closely related to oleic and ricinoleic acids), which together with its glyceride is thought by some to be both purgative and vesicating; it is oily, readily decomposable, slightly acid, forms salts, soluble in alcohol, severe irritant to skin and mucous membranes. Croton-resin is hard, brittle, pale-yellow, soluble in alcohol, ether, chloroform, vesicating property destroyed by long boiling with potassa or soda solution. *Test:* 1. Croton oil 2 Cc., nitric acid 1 Cc., water 1 Cc., well shaken, should not in any degree solidify upon standing 1–2 days (abs. other non-drying oils). Should be kept in well-stoppered bottles. Dose, ♏⅓–2 (.02–.13 Cc.).

ADULTERATIONS.—Various fixed non-drying oils, castor oil, etc.

Commercial.—All parts of the plant have been used in India from early times, the seeds are most active, and were introduced into Europe in 1630, as *grana Molucca*, *grana tiglia*, etc.; the root is used natively for drastic purging in dropsy; the leaves are so acrid as when chewed and swallowed to cause inflammation of lips, mouth, throat and alimentary canal; the wood in small doses is diaphoretic, large ones purgative, emetic. The seeds are mostly imported for the oil, which is extracted by: 1. Expression, 2. Decoction, 3. Solution (ether, alcohol, carbon disulphide, etc.), the former being preferred. After the first pressing the marc can be digested with alcohol at 54° C. (130° F.), then again expressed, distilling off alcohol; that extracted in India is from seeds slightly roasted to separate the shells easily, using only the kernels; this oil is pale-yellow; that from Europe has shells removed without heat and kernels alone pressed; this oil is a darker reddish-brown, due to greater age of seed and higher heat used in expression.

FIG. 229.



Croton Tiglium; lateral and ventral view, and longitudinal section of seed.

PREPARATIONS.—(Unoff.) *Liniment*, *Pill*, *Emulsion*, *Tincture*, or may give on lump-sugar.

PROPERTIES.—Powerful purgative, irritant poison, rubefacient, all due to local action. It is drastic, causing in 1–2 hours copious watery stools. Overdoses cause great congestion of intestinal canal, vomiting, purging, possibly death from gastro-enteritis. An alkali increases its purgation, which is often experienced by even smelling or rubbing the oil on the skin.

USES.—Mania, coma, obstinate constipation, lead colic, tæniæ, dropsies, dysentery, apoplexy, paralysis. Externally, rheumatism, gout, neuralgia, glandular swellings, pulmonary and laryngeal troubles, bronchitis, ovaritis, pleurisy. Can apply the oil direct to the surface by rubbing until dry ♏j–2 (.06–.13 Cc.), or the same quantity dissolved in either chloroform, olive oil, soap liniment, alcohol, ether or oil of turpentine.

Poisoning: Evacuate stomach, give milk, olive oil, mucilage, white of egg, gelatin, soup, opium, alcoholic liquids, warm stimulating baths.

CASCARILLA. CASCARILLA.

Croton Eluteria, (*Linné*) *Bennett.* } The bark.

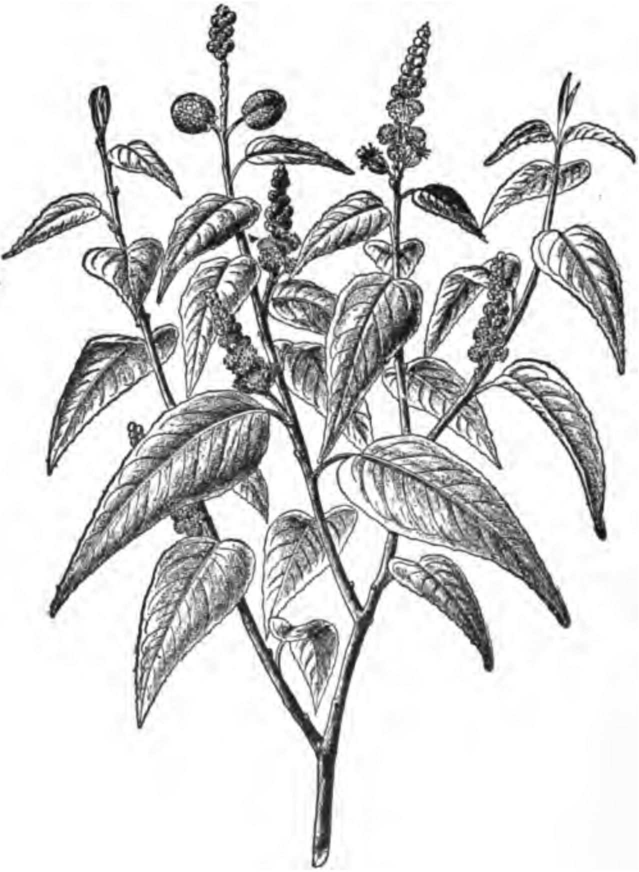
Habitat. Bahama Islands, low hills, Cuba, Hayti.

Syn. Eleuthera Bark, Sweet Wood Bark. Br. Cascarillæ Cortex, Cortex (Eluteriæ); Thuris. Fr. Cascarille, Chacrille, Écorce éleuthérienne. Ger. Cascarillrinde.

E-lu-te′ri-a. L. fr. *Eleuthera*, one of the Bahama Islands; *i. e.*, its habitat.

Cas-ca-ril′la. L. dim. of *cascara*, bark, rind (*cascar*, to break open), native name of bark.

FIG. 230.



Croton Eluteria.

PLANT.—Shrub or small tree 1.5–6 M. (5–20°) high; stem 2.5–20 Cm. (1–8′) thick; leaves 2.5–7.5 Cm. (1–3′) long, 2.5–5 Cm. (1–2′) wide, petiolate, ovate, lanceolate, under side bronzed-silver; flowers monœcious, white, odorous; fruit 15 Mm. ($\frac{5}{8}'$) thick; ovate, silvery-gray, 3-furrowed, 3-celled, each cell with one glossy orange-brown seed. BARK (sweet bark, as natively called), occurs in quills or curved pieces 10 Cm. (4′) long, 2 Mm. ($\frac{1}{12}'$) thick, with grayish fissured, detachable corky layer. Somewhat coated with whitish lichen, brown if uncoated, inside smooth, fracture short, with resinous and radially striate appearance, bast-fibres few. When burned emits an odor aromatic, musk-like, and when rubbed, the friction increases natural odor; taste warm, bitter. It is imported from Nassau in bags or casks. *Solvents:* diluted alcohol; hot water partially. Dose, gr. 15–30 (1–2 Gm.).

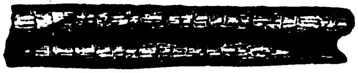
ADULTERATIONS.—With barks of the allied species, which resemble the official in appearance and medicinally.

CONSTITUENTS.—Volatile oil 1.6 p. c., Cascarillin (cascarilline), betaine, resin 15 p. c., (tannin, pectin, gum, starch, potassium chloride).

Volatile Oil.—Obtained by distillation, consists of $C_{10}H_{16}$ + an oxygenated portion.

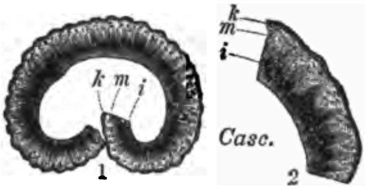
Cascarillin (Cascarilline), $C_{16}H_{24}O_5$.—This bitter principle or alkaloid is obtained by precipitating infusion with lead acetate, removing lead by hydrogen sulphide, evaporating filtrate, removing coloring and fatty matters with charcoal and alcohol, finally crystallizing from boiling alcohol; it is in white, bitter, inodorous crystals, soluble in alcohol, ether, hot water.

FIG. 231.



Cascarilla; bark quill.

FIG. 232.



Cascarilla; 1, cross-section enlarged; 2, cross-section 8 times enlarged; *k*, cork; *m*, middle bark; *i*, liber.

PREPARATIONS.—(Unoff.) *Tincture,* 20 p. c. (alcohol 70 p. c.). Dose, ʒss–2 (2–8 Cc.). *Infusion,* 5 p. c. *Extract.* Dose, gr. 5–8 (.3–.5 Gm.). *Fluid Extract.* Dose, ♏xv–30 (1–2 Cc.).

PROPERTIES.—Stimulant, tonic, febrifuge. Large doses nauseate.

USES.—Intermittents, dyspepsia, chronic diarrhœa, dysentery, flatulent colic, as a poor substitute for cinchona.

Incompatibles: Mineral acids precipitate resin from tincture and fluid extract, consequently should only be prescribed with the infusion.

Allied Plants:

1. *C. lu′cidus,* growing with the official plant; *C. ni′veus (pseudo-chi′na), Copalchi Bark,* Mexico, and *C. Mala′mbo, Malambo Bark,* Venezuela. All produce barks closely resembling official.

RICINUS. CASTOR OIL PLANT.

Oleum Ricini. Castor Oil, *official.*

Ricinus communis, *Linné.* } A fixed oil expressed from the seed.

Habitat. India. Cultivated in tropics; India, Italy (Spain, Sicily), United States.

Syn. Palma Christi, Castor Bean, Mexico Seed, Oil Plant, Bofareira, Oleum Palmæ Christi. Fr. Oleum e Semini Ricini, Huile de Ricin. Ger. Ricinusöl.

Ric′i-nus. L. a bug, dog-tick; *i. e.*, from the resemblance of the seeds.

Com-mu′nis. L. common, general; *i. e.*, it is the ordinary common species.

Plant.—This is quite variable in habit and appearance; in tropical countries a tree 9–12 M. (30–40°) high; in warm, temperate regions only a woody bush 3.6–4.5 M. (12–15°); in this climate herbaceous stems 1.6–3 M. (5–10°), hollow, smooth, glaucous, purplish bloom above; leaves with blade 15–20 Cm. (6–8′) broad, palmately divided (¾ depth) into 7–11 lanceolate, serrate segments, smooth, bluish-green, paler beneath, on long, curved, cylindrical, purplish petioles; flowers July, monœcious, large, apetalous, racemes, staminate being below, pistillate above; fruit tricoccous capsule 2.5 Cm. (1′) long, blunt, greenish, deeply grooved, sometimes smooth, usually spirescent on the three projecting sides, 3-celled, each cell 1-seeded, which is expelled in Aug.–Sept. by capsule dehiscing into 6 valves. Seed 12 Mm. (½′) long, 6 Mm. (¼′) broad, 3 Mm. (⅛′) thick, size of a coffee grain, grayish, marbled with blackish spots or bands of various tints and shapes, smooth, shining. In India have two varieties of seeds, *large* and *small;* the latter gives the best oil.

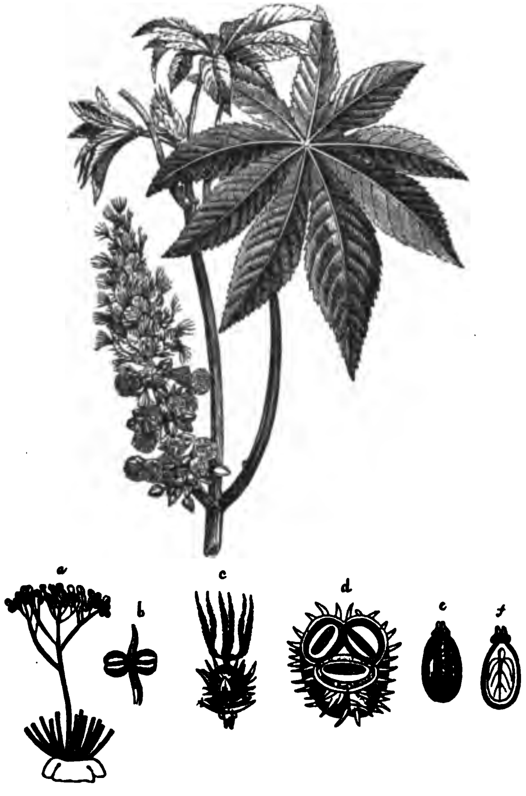
Constituents.—Seeds consist of testa 23.82 p. c., kernel 69.09 p. c.; of this latter have fixed oil 45–50 p. c., gum (mucilage) 2.4 p. c., starch and lignin 20 p. c., albumin 5 p. c., ricinin, proteids (emulsin), sugar, ash (testa 10 p. c., kernel 4 p. c.). The poisonous principle, ricin, is an albuminoid, soluble in 10 p. c. sodium chloride solution, precipitated by acids, coagulated by heat.

Oleum Ricini. Castor Oil.—Obtained from the seeds by expression, is a pale-yellowish, viscid, transparent liquid, faint, mild odor, bland, acrid, offensive taste, differing from all other fixed oils in its great solubility in alcohol and insolubility in benzin, sp. gr. 0.960, saponifies with alkalies. Contains mostly ricinolein (the glyceride of ricinoleic acid), also palmitin, ricinoleic acid (ricinic acid), $C_{18}H_{34}O_3$; this acid is a viscid oil which, by nitrous acid, is converted into ricinelaidic acid, crystalline, melting at 50° C. (122° F.). *Tests:* 1. Soluble in equal volume alcohol, glacial acetic acid, 3 volumes of mixture, alcohol 19 + water 1 vol. (abs. of more than 5 p. c. other fixed oils). 2. Oil 3 Cc., carbon disulphide 3 Cc., sulphuric acid 1 Cc., shaken together, should not be blackish-brown (abs. many foreign oils). At 0° C. (32° F.) separates into crystalline flakes; at − 18° C. (− 0.4° F.) congeals into yellow mass. Should be kept in well-stoppered bottles. Dose, ʒj–8 (4–30 Cc.).

ADULTERATIONS.—Occasionally with several fixed oils and fats.

Commercial.—Plant called Palma Christi, from the supposed shape of leaves resembling Christ's hand, is extensively cultivated in United States for the oil, which is extracted from the seeds by: 1. Expression, 2. Decoction, 3. Solvents (ether, alcohol, carbon disulphide, etc.). The first is preferred and consists of heating clean seeds in shallow tanks to 65° C. (150° F.), not scorching, but rendering oil more fluid; these are now put into hempen bags, placed between hot iron plates, and pressed hydraulically. This white oil is run into iron vats with water, boiled to separate impurities (albumin is coagulated, removed by skimming; mucilage and starch dissolve in water); now strain, reboil to destroy acidity, again strain, filter, put in cans or barrels—as such constitutes our *cold-pressed castor oil* on the market. By grinding marc with water and expressing may obtain additional good oil; the yield by cold expression 25–30 p. c., with heat 35–45 p. c. The method by decoction is not so valuable, as water extracts

FIG. 233.



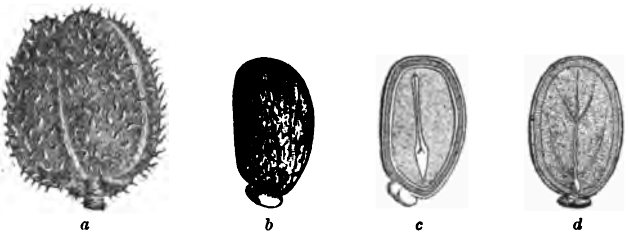
Ricinus communis; *a*, stamen; *b*, anther; *c*, stigmas; *d*, transverse section of capsule; *e*, seed; *f*, embryo.

poisonous ricin, and the heat increases oil's acidity; for this the seeds (testa or husks being removed) are crushed, boiled with water, when oil floats on top; strain, reboil to dissipate acrid principle, strain, filter. This oil is usually brownish, acrid, irritating and comes from E. and W. Indies. The method, by solution (ether, alcohol, etc.), causes oil to turn rancid quicker, though in France and Italy, such is considered to be more agreeable and efficacious. The so-called popular *Italian Castor oil* is produced extensively around Verona, Italy, where only fresh seeds thoroughly deprived of coating are expressed hydraulically. This oil, though just as powerful, is remarkably free from the usual disagreeable odor and taste. An ethereal or alcoholic tincture of the seeds is claimed to be less irritating and not to nauseate.

PREPARATIONS.—(Unoff.) *Emulsion. Capsules. Paste.*

PROPERTIES.—Purgative, demulcent. It is non-irritating until the duodenum is reached where the bile and pancreatic juice decompose it into glycerin and ricinoleic acid, this latter combines with sodium, forming sodium ricinoleate, which mildly irritates the bowels, causing purgation, stimulating muscular glands and coat, but not the liver. Acts in four to six hours, producing several liquid stools without pain or tenesmus, followed by sedative effect on intestines. Leaves are said to be galactagogue when applied to breast and impart catharsis to the milk and various secretions. Glycerin increases its purgation.

FIG. 234.



a, ricinus fruit; *b*, seed; *c* and *d*, longitudinal sections.

USES.—Constipation, colic, diarrhœa, dysentery, enteritis in pregnancy, puerperal women, tape and lumbricoid worms, traumatic fever, renal calculi, night-sweats, amenorrhœa, engorged liver, hemorrhoids, cystitis, gonorrhœa. In dysentery may add laudanum, ♏xx (1.3 Cc.), to each dose in order to counteract pain, tenesmus and exhaustion from frequent passages; externally applied to warts, as a local sedative, protective.

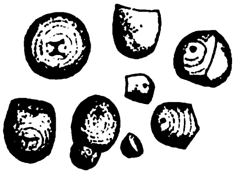
Administration.—In emulsion flavored to suit, or equal quantities of oil and either heavy sarsaparilla, peppermint, or cinnamon syrup beaten together, or take with sodawater, malt liquor, orange juice, coffee, etc. All disguise very effectively the nauseating oil taste. The seeds were once employed, but action too violent; their griping principle (ricin) is said to reside in the embryo and testa, hence to make best oil most of these should be removed before expressing. Usually it needs no purification, but should it be opaque it is filtered through paper and felt, after being treated with magnesia 1 p. c. and charcoal 2.5 p. c.

Allied Plants:

1. *Ompha'lea olei'fera, Tambor Oil.*—C. America. Expressed from the seeds; a good purgative, does not gripe like castor oil.

2. *Man'ihot Manihot* (*utili'ssima*), *Tapioca.*—(See page 82.) The fecula of root (rhizome), official, 1820–1880. Brazil, W. Indies. Shrub 2–2.5 M. (6–8°) high; stem jointed, petiolate leaves at upper portion, 3–5- to 7-lobed, glaucous. Root fleshy, white, tuberous, 1 M. (3°) long, weighing 20–30 lbs. (9–13 Kg.). Matures in eight months; contains poisonous (HCN) milky juice; this is pressed out and the cassava meal is made into bread or washed for its starch, which is diaphanous, muller-shaped, layers indistinct, hilum near rounded end, only half size of potato starch, which furnishes the factitious tapioca. Used as nutrient, demulcent, non-irritant for convalescence, debility, low state of disease, in doses ℥ss–1 (15–30 Gm.) prepared with boiling water, flavored with lemon juice, sugar, vanilla, aromatics, wine, etc.

FIG. 235.



Tapioca starch.

STILLINGIA. STILLINGIA (QUEEN'S ROOT).

Stillingia sylvatica, *Linné.* } The root.

Habitat. S. United States in sandy soil, pine-barrens (Virginia to Florida, Louisiana).

Syn. Queen's Delight, Silver Leaf, Cock-up Hat, Marcory, Nettle Potato, Yaw Root. Fr. Stillingie. Ger. Stillingie.

Stil-lin'gi-a. L. after Benj. Stillingfleet, English botanist, author of *Miscellaneous Tracts on Natural History*, 1759.

Syl-vat'i-ca. L. *silvaticus*, fr. *silva*, a wood, of the woods, forests; *i. e.*, grows in pine-barrens of the South.

PLANT.—Perennial lactiferous herb; stem .3–1 M. (1–3°) high, erect, smooth, simple; leaves lanceolate, sessile, serrate; flowers May–June, monœcious, yellow, spikes—staminate above, pistillate below, cup-shaped glands among them; fruit round capsule, rough, greenish-brown, 3-celled, each cell 1-seeded, plant when wounded emits milky juice. ROOT, .3 M. (12′) long, 5 Cm. (2′) thick, subcylindrical, slightly branched, compact, wrinkled, tough, grayish-brown, fracture fibrous, bark thick, wood porous, inner bark and medullary rays with many yellowish-brown resin-cells; odor peculiar, unpleasant; taste bitter, acrid, pungent. Collect in late autumn or early spring. *Solvents:* boiling water; diluted alcohol. Dose, gr. 15–30 (1–2 Gm.).

CONSTITUENTS.—Sylvacrol, Volatile oil, resin, glucoside, fixed oil, tannin, gum, starch, ash 5 p. c.; has no alkaloid (stillingine).

Sylvacrol.—Acrid resin, to which pungency is due, soluble in alcohol, chloroform, benzin.

Volatile Oil.—Gives acrimony, odor and taste, hence root deteriorates with age; that (oil) on the market is an ethereal extract.

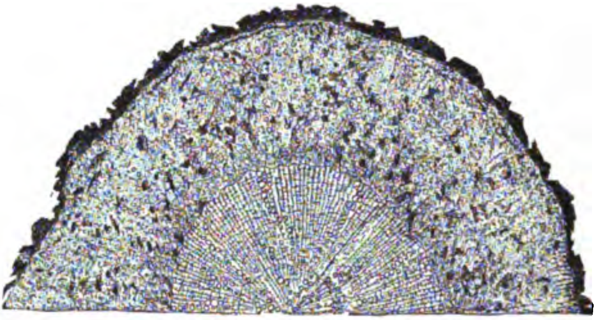
PREPARATIONS.—1. *Extractum Stillingiæ Fluidum.* Fluid Extract of Stillingia. (Syn., Fr. Extrait liquide de Stillingie; Ger. Flüssiges Stillingien-Extract.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

Unoff. Preps.: Extract. Dose, gr. 2–5 (.13–.3 Gm.). *Tincture.* Dose, ʒss–2 (2–8 Cc.). *Decoction.* Dose, ℥j–2 (30–60 Cc.). *Compound Syrup* (contains stillingia, corydalis, iris, chimaphila, coriander, xanthoxylum, sambucus, sugar, alcohol and water). Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Alterative, antivenereal. Large doses emetic, cathartic. As alterative it is expectorant, diuretic, diaphoretic, sialagogue, cholagogue, increases heart action, circulation and various secretions.

FIG. 236.



Stillingia root, magnified 10 diam.

USES.—Syphilis, scrofula, skin troubles, chronic hepatic affections, intermittents, constipation. Popular in the South since 1800, when it was introduced by Dr. Simons, often associated with sarsaparilla.

Allied Plants:

1. *S. sebi'fera,* L. *sebum,* tallow, + *ferre,* to bear.—China. Tree 6–9 M. (20–30°) high, fruit 3-celled, 3-seeded, imbedded in solid inodorous fat (palmitin, stearin), melts at 44° C. (112° F.), called China or Vegetable Tallow; used for candles. Grows also in S. Carolina, Georgia, Florida, along seacoast.

2. *Euphor'bia corolla'ta, Flowering (Blooming) Spurge.*—The root official, 1820–1880. S. United States. Perennial herb, .6–1 M. (2–3°) high; leaves lanceolate; flowers umbels, 5- (3–7-) forked, white; root many-headed, .5 M. (18′) long, 5–25 Mm. (⅕–1′) thick, blackish-brown, fissured, bark thick, white inside, sweet, bitter, acrid. Contains glucoside, resin, euphorbon; yields milky juice when punctured.

Used as diaphoretic (gr. 5 ; .3 Gm.), cathartic (gr. 10 ; .6 Gm.), emetic (gr. 20 ; 1.3 Gm.), expectorant (gr. 2–5 ; .13–.3 Gm.), vesicant ; in infusion, decoction.

3. *E. Ipecacuan'ha, Ipecac Spurge, Wild Ipecac.*—The root official, 1820–1880. United States. Plant resembles preceding, being a green or purple perennial, 12.5–25 Cm. (5–10′) high, stem forked from the base ; leaves obovate, glabrous ; flowers inconspicuous ; fruit angled pod, smooth ; seed white, dotted ; root several-headed, .6 M. (2°) long, knotty, with stem-scars, 10 Mm. (⅖′) thick, branched, brown, wrinkled, bark thick, white inside, sweet, bitter, acrid. Constituents, properties, and uses similar to preceding.

4. *E. piluli'fera, Snake-weed, Cat's-hair.*—Australia, W. Indies. Small, branching, wayside annual. Acts directly upon the heart, and respiration, to the extent sometimes of causing death. Chiefly used in asthma, chronic bronchitis. Dose, ʒss–1 (2–4 Gm.), fluid extract.

KAMALA. KAMALA (Rottlera).

Mallotus philippinensis, (*Lamarck*) *Mueller Arg.* } The glands and hairs from the capsules.

Habitat. Philippine Islands, India, China, Australia, Abyssinia, Southern Arabia, Hindustan, Ceylon, ascending 1,350 M. (4,500°).

Syn. Kameela, Monkey-face Tree, Wurrus, Spoonwood, Glandulæ Rottleræ. Fr. Kamala, Kalmie. Ger. Kamala.

Mal-lo′tus. L. fr. Gr. *μαλλωτός*, woolly, fleecy ; *i. e.*, young branches, leaves and capsules covered with fine hair or wool.

Phi-lip-pi-nen′sis. L. of or belonging to Philippine Islands ; *i. e.*, its habitat.

Ka-ma′la. Hindoo name of the powder as used for an orange dye in silks.

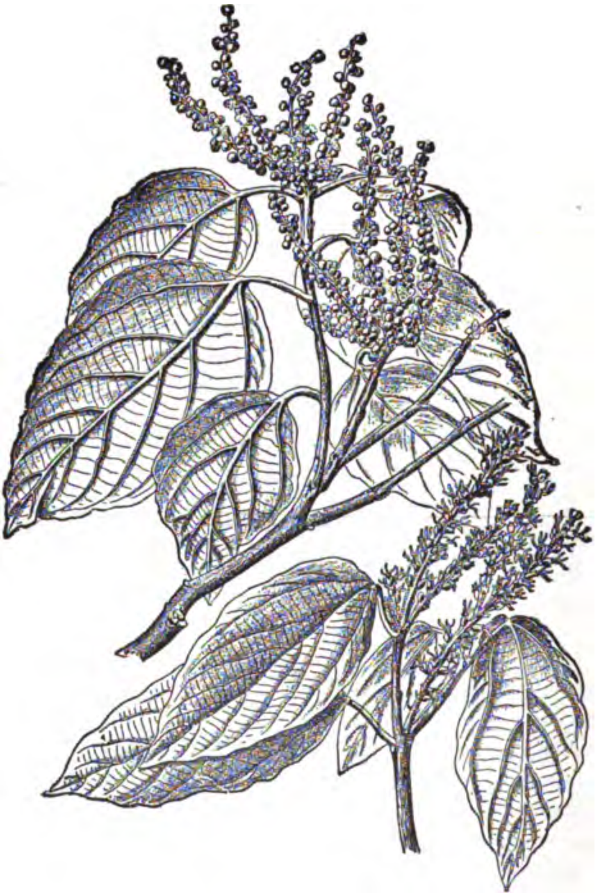
Rot′tler-a. L. after Rev. Dr. Rottler, Danish Missionary at Tranquebar, India, who died in 1836.

Plant.—Small tree 4.5–6 M. (15–20°) high ; stem .3 M. (1°) thick ; bark pale, young branches with ferruginous tomentum ; leaves 7.5–15 Cm. (3–6′) long, petioles 2.5–5 Cm. (1–2′) long, ovate, entire, coriaceous, glabrous, under side with rusty, stellate hairs ; flowers Nov.–Jan., diœcious ; pistillate racemes ; staminate 3 together, panicles, both tomentose, the former reddish, the latter yellowish ; fruit globular capsule, tricoccous, 12 Mm. (½′) thick, size small cherry ; externally 3-furrowed, covered with red powder. Glands and hairs (kamala), glandular, mobile, brick-red powder, inodorous, nearly tasteless, reddens alkaline liquids, alcohol, ether, chloroform, tinges boiling water yellow. Under microscope appears as stellately arranged colorless hairs mixed with depressed globular glands, containing numerous red club-shaped vesicles. When thrown into fire burns like lycopodium, and ash should not be over 4–8 p. c. *Solvents :* alcohol ; ether or alkaline solutions extract most of the virtues. Dose, ʒj–2 (4–8 Gm.).

Adulterations.—With powdered leaves, fruit stalks, starch colored with fuchsin, earthy matter, sand, in all sometimes 60 p. c. ; these detected by increasing largely the ash.

Commercial.—Women and children in March collect capsules, throw them into large baskets in which they are rolled about and rubbed with hands, thus divesting them of powdered glands and hairs; these, falling through the meshes as a sieve, are caught upon cloths spread below for the purpose; they are then put into small bags and sent to the plains for market.

FIG. 237.



Mallotus philippinensis; *a*, twig of staminate plant; *b*, twig of pistillate plant.

CONSTITUENTS.—Resins 80 p. c., Rottlerin, albuminous matter 7 p. c., cellulose 7 p. c., ash 4 p. c.

Resins.—Contain the coloring matter; obtained by digesting with either ether, alcohol, glacial acetic acid or carbon disulphide; one is soluble in cold, the other in hot alcohol.

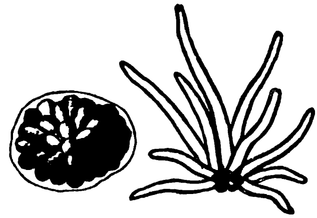
Rottlerin, $C_{22}H_{20}O_6$.—Extract with ether or carbon disulphide, let stand two days for crystals to deposit; it is a resinous coloring substance occurring in yellowish needles, soluble in hot alcohol (red), ether, benzene, carbon disulphide, changing on exposure.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ʒj–2 (4–8 Cc.). *Tincture,* 30 p. c. (alcoholic). Dose, ʒj–4 (4–15 Cc.). *Electuary. Syrup. Mucilage.*

PROPERTIES.—Tænifuge, anthelmintic, purgative. Sometimes causes colic, nausea, seldom vomits.

USES.—Long employed in India for tapeworm, but popularized by British surgeon Mackinnon, who had only 4 p. c. of failures with it among his soldiers. There need be no preparation for its administration, although the usual fasting and purgative renders the drug's action more certain and efficient. Soldiers of India have to take it frequently, who, as a rule, pass the worm dead, in the third or fourth stool, within four or five hours, whereupon they immediately go about their military duties as though nothing had happened. If first dose fails to act on bowels, may repeat in four hours, or can follow with a dose of castor oil. May also be employed to kill *Ascaris lumbricoides* and *Oxyuris vermicularis.* Externally, in scabies, skin affections, herpetic ringworm. Ranks next to male-fern for tænia. Much better than kousso or turpentine. Used in India for dyeing silk rich-orange-brown, which dye in Aden is somewhat confusingly called Warras, Wurrus.

FIG. 238.



Kamala, magnified 190 diam.

Allied Products:

1. *Flemi'ngia rhodoca'rpa, Wars, Wurrus.*—Ar. for saffron. Papilionaceæ. E. Africa. This is a powder, coarser than kamala, deep-purple, turning black in water, odor slight; consists of subconical or cylindrical glands, enclosing oblong vesicles arranged in 3 or 4 tiers; glands usually are mixed with somewhat long and simple hairs; contain flemingin, $C_{12}H_{12}O_3$ (crystalline, resembling rottlerin), homoflemingin, two resins, albumin, cellulose, ash 6 p. c.; used as vermifuge, in skin troubles and as a dye. There is also an inferior kind of *Wars,* which consists of the altered starch from Flamingia seeds, mixed with a considerable amount of red sand.

2. *Albi'zzia (Acacia) anthelmi'ntica, Mesenna, Mussena, Busenna.*—Abys. names for acacia bark. Mimosaceæ. Abyssinia, Tuscany. Bark used in medicine, which occurs in flat or bent pieces .3 M. (1°) long, 2.5–5 Cm. (1–2′) wide, 5 Mm. (⅕′) thick, yellowish-brown, smooth, inodorous, inner layers with nauseous sweet, bitterish, persistently acrid taste; contains muserin (amorphous, saponin-like), bitter, saccharine, and coloring principles, ash 5.5 p. c.; infusion colored yellow by ferric chloride.

3. Many fruits, as Soria, Satze (Tatze), Embelia Ribes, etc., are employed as tænifuges, in India, Abyssinia, etc.

RECAPITULATION No. 6.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Linaceæ:								
1. Linum. 2. Linseed (Flaxseed).	Linum usitatissimum.	The seed.	Levant, S. Europe (United States).	Fixed oil, mucilage, proteids, amygdalin, resin.	....	Demulcent, emollient, diuretic.	Internal inflammations, catarrh, dysentery.	60–120 (4–8 Gm.)
1. Oleum Lini. 2. Linseed Oil.	....	The fixed oil.		Linolein, glycerides of palmitin, myristin and olein.	Soft soap, liniment of soft soap, linimentum calcis.	Demulcent, laxative.	Piles, erysipelas.	Minims. 240–960 (15–60 Cc.)
Erythroxylaceæ:								
1. Coca (Erythroxylon). 2. Coca (Erythroxylon).	Erythroxylon Coca.	The leaves.	S. America (Peru, Bolivia).	Cocaine, hygrine, benzoyl-ecgonine, cinnamylcocaine, truxillococaine, coca-tannic acid.	Fld. extr., cocaine hydrochlorate.	Stimulant, tonic, diaphoretic, narcotic, anæsthetic.	Wasting diseases, convalescence, stomatitis, bronchitis, surgery.	Grains. 15–60 (1–4 Gm.)
Zygophyllaceæ:								
1. Guaiaci Lignum. 2. Guaiacum Wood.	Guaiacum: officinale, sanctum.	The heart wood.	W. Indies, Northern S. America.	Resin, extractive.	Decoction sarsaparilla comp.	Stimulant, diaphoretic, alterative.	Syphilis, rheumatism, scrofula, skin troubles.	30–120 (2–8 Gm.)
1. Guaiaci Resina. 2. Guaiac.		The resin of the wood.		Guaiacic acid, guaiac-yellow, guaiaretic acid, guaiaconic acid.	Tincture, ammoniated tincture, pil. antimony comp.			5–30 (.3–2 Gm.)
Rutaceæ:								
1. Xanthoxylum. 2. Xanthoxylum (Prickly Ash).	Xanthoxylum: americanum, Clava-Hérculis.	The bark.	N. America.	Volatile oil, resin, xanthoxylin-e, tannin.	Fluid extract.	Alterative stimulant, emmenagogue, sialagogue.	Rheumatism, dropsy, syphilis, pharyngitis.	10–30 (.6–2 Gm.)
1. Pilocarpus. 2. Pilocarpus (Jaborandi).	Pilocarpus: Jaborandi, pennatifolius.	The leaflets.	S. America (Brazil).	Volatile oil, pilocarpine, jaborine, salts, acid.	Fluid extract, pilocarpine hydrochlorate.	Diaphoretic, sialagogue, myotic, emetic, cardiac depressant.	Dropsy, rheumatism, pleurisy, coryza, Bright's disease, eye troubles.	15–30 (1–2 Gm.)
1. Buchu. 2. Buchu.	Barosma: betulina, crenulata.	The leaves.	S. Africa.	Volatile oil, diosphenol, resin, bitter principle (rutin).	Fluid extract.	Diuretic, stimulant, tonic.	Urinary troubles, bladder catarrh, etc., feeble digestion, flatulence.	15–30 (1–2 Gm.)
1. Aurantii Amari Cortex. 2. Bitter Orange Peel.	Citrus amara (vulgaris).	The rind of the fruit.	N. India.	Volatile oil, hesperidin, fixed oil, tannin, resin.	Fld. extr., tinct., tr. cinch. co., tr. gent. co., *Ol. aur. flo.*: aqua, aq. fortior, syr.	Stimulant, tonic, carminative, stomachic, flavor.	Indigestion, flatulence, corrigent to purgatives.	15–30 (1–2 Gm.)
1. Aurantii Dulcis Cortex. 2. Sweet Orange Peel.	Citrus Aurantium.	The rind of the fresh fruit.			Syr., tinct., *Oil*: sp. comp., sp. myrciæ.			oil. ♏j–5 (.06–.3 Cc.)
1. Limonis Cortex. 2. Lemon Peel.	Citrus Limon(i)um.	The rind of the recent fruit.	N. India.	Volatile oil, hesperidin.	Spirit, *Oil*: spirit, spirit aurantii comp., spt. ammon. ar., *Citric acid*: syrup.	Stimulant, flavor.	Indigestion.	Grains. 30–60 (2–4 Gm.)

1. Limonis Succus. 2. Lemon Juice.	....	The juice.	N. India.	Citric and malic acids, gum, sugar.	....	Refrigerant, diuretic.	Febrile inflammation, scurvy, rheumatism.	Minims. 120-300 (8-20 Cc.)
1. Oleum Bergamottæ. 2. Oil of Bergamot (Oleum Bergamii).	Citrus Bergamia.	The volatile oil.	S. Europe.	Citrene, bergaptene linalool acetate.	....	Stimulant, excitant, aromatic.	Perfumery.	
Simarubaceæ: 1. Quassia. 2. Quassia.	Picrasma excelsa.	The wood.	Jamaica.	Picrasmin (quassin), resin, alkaloid, mucilage.	Extract, fluid extract, tincture.	Tonic, febrifuge, anthelmintic, bitter.	Dyspepsia, diarrhœa, constipation, loss of appetite.	Grains. 15-60 (1-4 Gm.)
Burseraceæ: 1. Myrrha. 2. Myrrh.	Commiphora Myrrha.	The gum-resin.	E. Africa.	Volatile oil, resin, gum, bitter principle.	Tincture, tr. aloes and myrrh, pil. aloes and myrrh, pil. rhei comp., mist. ferri comp.	Stimulant, tonic, expectorant, emmenagogue, vulnerary.	Dyspepsia, amenorrhœa, anæmia, pharyngitis, diseased gums, ulcers, disinfectant.	5-30 (.3-2 Gm.)
Polygalaceæ: 1. Senega. 2. Senega.	Polygala Senega.	The root.	United States.	Senegin, polygalic acid, fixed oil, vol. oil, resin, pectin, malates.	Fluid extract, syrup, syrup squill comp.	Expectorant, diuretic, diaphoretic.	Bronchitis, croup, asthma, renal dropsy, rheumatism, pneumonia, amenorrhœa.	5-30 (.3-2 Gm.)
Euphorbiaceæ: 1. Elastica. 2. India Rubber (Caoutchouc).	Hevea species.	The prepared milk-juice.	S. America, India.	Resin, fat, volatile oil, albumin, coloring, hydrocarbon, $C_{20}H_{32}$.	Charta sinapis.	....	Fabrics, implem'ts, etc., for surgery and many appliances in the arts.	
1. Oleum Tiglii. 2. Croton Oil.	Croton Tiglium.	The fixed oil.	India, Philippine Islands.	Glycerides of formic, acetic, tiglinic, valerianic, palmitic, and stearic acids, crotonol, croton-resin, crotonoleic acid.	....	Powerful purgative, irritant, rubefacient.	Mania, constipation, tæniæ, dropsies, dysentery, paralysis, rheumatism, swellings, pneumonia, ovaritis, pleurisy.	Minims. ⅓-2 (.02-.13 Cc.)
1. Cascarilla. 2. Cascarilla.	Croton Eluteria.	The bark.	Bahama Islands.	Volatile oil, cascarillin, betaine, resin, tannin, starch.	....	Stimulant, tonic, febrifuge, nauseant.	Intermittents, dyspepsia, chronic diarrhœa, colic, flatulence.	Grains. 15-30 (1-2 Gm.)
1. Oleum Ricini. 2. Castor Oil.	Ricinus communis.	The fixed oil.	India, Europe.	Ricinolein, palmitin, ricinoleic acid.	....	Purgative, demulcent.	Constipation, colic, diarrhœa, enteritis, worms, fevers, calculi, amenorrhœa, cystitis, gonorrhœa.	Minims. 60-480 (4-30 Cc.)
1. Stillingia. 2. Stillingia (Queen's Root).	Stillingia sylvatica.	The root.	United States.	Sylvacrol resin, glucoside, fixed oil, volatile oil, tannin.	Fluid extract.	Alterative, antivenereal, emetic, cathartic.	Syphilis, scrofula, skin diseases, liver affections, intermittents, constipation.	Grains. 15-30 (1-2 Gm.)
1. Kamala. 2. Kamala (Rottlera).	Mallotus philippinensis.	The glands and hairs from the capsules.	Philippine Islands, India, China, Australia.	Resin, rottlerin, albumin.	....	Tænifuge, anthelmintic, purgative.	Tape-worm, roundworms, scabies, skin troubles, ring-worm.	60-120 (4-8 Gm.)

52. ANACARDIACEÆ. Sumac(h) Family.

An-a-kar-di-a′se-e. L. *Anacardi-um* + aceæ, fr. Gr. *ἀνά*, alike, + *καρδία*, heart; *i. e.*, fruit heart-shaped. Trees or shrubs. Distinguished by abounding in a resinous, gummy, acrid, milky juice; exhalations or juice often poisonous, latter black on drying; ovary 1-celled; styles 1–3 or none; ovules solitary with long funiculus; calyx and corolla regular, 5-lobed, rarely 3–4–7; stamens same number or double the petals. Disk present or wanting; fruit drupe or nut-like, edible; seed exalbuminous, superior; tropics; varnishes, dyes, poisonous.

Genera: 1. **Rhus.** 2. **Pistacia.**

RHUS GLABRA. RHUS GLABRA (SUMACH).

Rhus glabra, *Linné.* } The fruit.

Habitat. N. America, west to California, Idaho, on barren or rocky soil.

Syn. Mountain-, Dwarf-, Sleek-, Smooth-, Upland-, Scarlet, or Pennsylvania Sumach, Indian salt (powder on the berries). Fr. Sumach, Sumac. Ger. Sumach.

Rhus′. L. fr. Gr. *ῥοῦς*; Celtic *rhudd*, red; *i. e.*, color of the fruit, also the leaves of the same species in autumn.

Gla′bra. L. fr. *glaber*, smooth, hairless; *i. e.*, its leaves and branches.

Su′mach. L. fr. Ar. *summaq*; *i. e.*, their native name for the plant.

PLANT.—Woody shrub 1.5–4.6 M. (5–15°) high; stem more or less bent, dividing into many straggling branches, pith large, wood thin, white; bark smooth, grayish or reddish, with small scattered warts; leaves imparipinnate; leaflets 11–31, lanceolate, acuminate, serrate, whitish beneath, changing to a beautiful-red in autumn; flowers June–July, greenish-red, terminal panicles. FRUIT, Sept., drupes in clusters of small crimson berries 3 Mm. (⅛′) thick, subglobular, densely hairy, containing roundish, oblong, smooth putamen; inodorous; taste acidulous. *Solvent:* diluted alcohol. Dose, ʒss–1 (2–4 Gm.).

Commercial.—Sumach grows in waste fields, along fences, woods, etc., the bark, galls, and leaves are very astringent, being collected during summer or fall for use in tanning and dyeing, while from these an extract is made containing 25–30 p. c. tannin, and this is its most convenient form for all trade and chemical purposes. For this extract sumach is cultivated in Virginia and other States.

CONSTITUENTS.—I. FRUIT: Acid Calcium and Potassium malates, tannin (gallo-tannic acid) 6–27 p. c., coloring matter. II. SEEDS: Fixed oil. III. GALLS: Tannin 60–70 p. c.

PREPARATIONS.—1. *Extractum Rhois Glabræ Fluidum.* Fluid Extract of Rhus Glabra. (Syn., Fr. Extrait liquide de Sumac; Ger. Flüssiges Sumach-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10, diluted alcohol 90 Cc., finishing with latter alone q. s. 100 Cc. Dose, ʒss-1 (2–4 Cc.).

Unoff. Preps.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

Properties.—Astringent, refrigerant, diuretic; resembles tannin.

Uses.—Catarrhal affections of stomach and bowels, pharyngitis, tonsillitis, mercurial aphthæ, spongy gums, and other kinds of mouth troubles (as a gargle), ulcers, wounds, etc. (as a wash).

Allied Plants:

1. *R. aroma'tica, Fragrant* or *Sweet-scented Sumach.*—1.5–2.5 M. (5–8°) high; given in tincture, extract and fluid extract (alcoholic), for hæmaturia, leucorrhœa and enuresis, but mainly for incontinence of urine. Dose, gr. 10–30 (.6–2 Gm.). *R. copalli'na, Black, Dwarf* or *Mountain Sumach*, 1–2.5 M. (3–8°) high; downy branches; leaflets entire; excels all in yield of tannin. *R. hi'rta* (*typhi'na*), *Staghorn Sumach*, 4.5–9 M. (15–30°) high; hairy; leaflets serrate. All three indigenous to N. America.

2. *R. Coria'ria, European Sumach.*—Mediterranean Basin; leaflets elliptic, woolly, serrate.

3. *R. semialata* and *R. japonica.*—China, Japan. These furnish galls which are largely used in Germany for obtaining tannic and gallic acids (see page 153).

The fruits of all these are red, hairy, and acidulous, while the leaves are astringent.

RHUS TOXICODENDRON. RHUS TOXICODENDRON (Poison Ivy).

Rhus radicans, *Linné*. } The fresh leaves.

Habitat. N. America (Can., Fla., west to Wyo., Tex.), in the thickets.

Syn. Poison Ash, Poison Vine, Poison Ivy, Poison Oak or Vine Sumach, Three-leaved, Climbing or Trailing Sumach. Fr. Sumach vénéneux. Ger. Gift-Sumach.

Tox-i-co-den'dron. L. fr. Gr. *τοξικόν*, poison, + *δένδρον*, tree; *i. e.*, its poisonous properties, and when climbing trees (oaks) gives them a poisonous leafy armor.

Rad'i-cans. L. *radican*(*t*)*s*, fr. *radicare*, rooting, to take root; *i. e.*, stems send out roots for climbing.

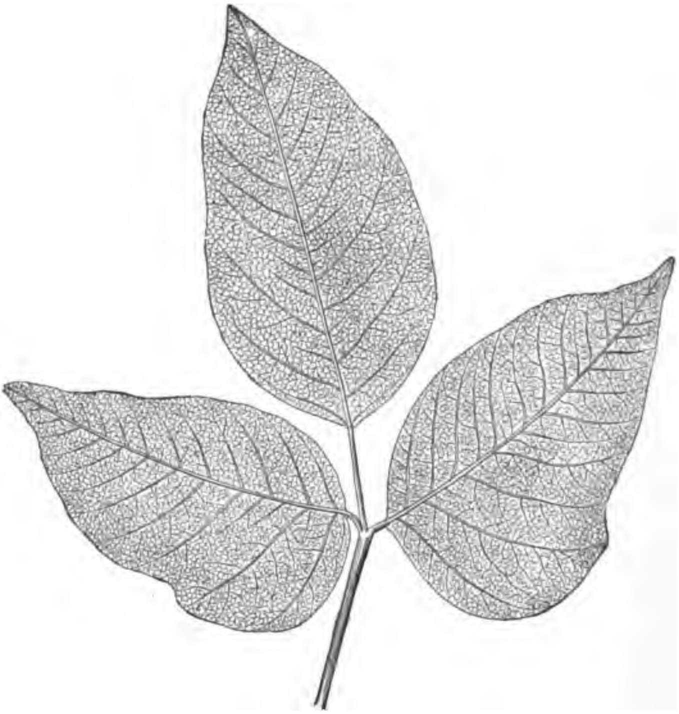
Plant.—High climber, 9–15 M. (30–50°) long, over rocks, trees, and various supports by rootlets; flowers June–July, small, racemose, axillary, subsessile panicles, drupes smooth, roundish, pale-brown. Leaves, should be collected May–June, are long, petiolate, trifoliate; lateral leaflets nearly sessile, 10 Cm. (4') long, obliquely ovate, pointed, terminal leaflet stalked, ovate-pointed, base wedge-shaped or rounded; leaflets entire and glabrous or variously notched, downy, when dry papery, brittle, inodorous; taste astringent, acrid; when fresh have acrid juice, black by exposure, which applied to skin swells and inflames, hence must not handle ungloved. These must not be confounded with the harmless *Pte'lea trifolia'ta, Three-leaved Hop-tree*, which resemble but have leaflets sessile, thicker and paler-green. *Solvent:* alcohol. Dose, gr. 2–5–15 (.13–.3–1 Gm.).

Constituents.—Toxicodendrol 3.3 p. c., Toxicodendric acid, tannin, fixed oil, wax, mucilage.

Toxicodendrol.—Poisonous; obtained by distilling alcoholic extract, when a black oily residue is left, which upon purification yields toxicodendrol as an agreeably odorous, viscid, non-volatile oil; this is the active irritating principle, soluble in alcohol, ether, benzene, chloroform, insoluble in water, decomposed by heat, slowly changes to a resin by exposure, precipitated by lead acetate.

Toxicodendric Acid.—Non-poisonous; obtained by bruising leaves with 6 p. c. slaked lime, macerating with water, adding to expressed liquid sulphuric acid in excess and distilling, when the acid comes over and condenses; it is volatile, hence almost absent in dried leaves, reduces gold from the chloride, soluble in water, precipitated black with silver nitrate, but white with lead acetate; resembles formic and acetic acids in reaction. Tannic acid here present gives greenish precipitate with iron salts.

Fig. 239.



Rhus radicans; leaf one-half natural size.

Preparations.—(Unoff.) *Tincture* (fresh leaves bruised and macerated with equal weight of alcohol). Dose, ♏ $\frac{1}{10}$–1 (.006–.06 Cc.). *Juice* (expressed from leaves and preserved with alcohol) is soluble in ether and possesses all the virtues of the plant. *Fluid Extract.* Dose, ♏v–30 (.3–2 Cc.). *Extract* is not good, owing to heat used in preparing.

PROPERTIES.—Irritant, rubefacient, narcotic, poisonous.

Internally, it produces gastro-intestinal inflammation, drowsiness, stupor, vertigo, nausea, chilliness, thirst, weak and irregular pulse, diaphoresis, muscular debility, diuresis, mydriasis, delirium, faintness, trembling, fever, sometimes convulsions; the root has occasioned death. Externally, when the fresh leaves, juice or vapor poisons the skin, we have itching, burning, redness, tumefaction, vesication, ultimately desquamation, lasting from one to two weeks. The inflammation resembles somewhat erysipelas, and all persons are not affected by it alike, some mildly, others can handle and even chew the leaves without any result; the plant is most virulent during florescence.

USES.—Was first used medicinally about 1795, when a student suffering with chronic eczema was accidentally poisoned by it, and with the subsidence of the poisonous effects the eczema disappeared. Hence now used in skin affections, eczema, erysipelas, subacute rheumatism, typhoid fever, paralysis of lower extremities dependent upon rheumatism, cold or dampness, paraplegia, incontinence of urine; externally in sprains, burns, stings, chilblains, etc., in form of a ½ p. c. lotion. The juice becomes so dark, non-erasable, as to be used for indelible ink.

Poisoning: At once apply locally soap and water with scrubbing brush, then lead water, alkaline solutions (sodium bicarbonate, sulphite, chlorinated, diluted ammonia, soap-suds, alum curd), tincture or infusion of lobelia, grindelia or sassafras, cocaine solution 4–8 p. c., aristol, glycerite of carbolic acid, opium; oils, vaselin, alcohol, being solvents of the poison, only serve to spread the trouble; give internally cooling drinks, low diet and saline purgatives, quietness; may inject Monsel's solution into the vesicles.

Allied Plants:

1. *R. Toxicode'ndron.*—This properly is more or less shrubby, .6–1 M. (2–3°) high, erect, leaflets crenately-lobed, pubescent, also called Poison Oak; it is merely a variety of *R. radicans*. *R. diversi'loba.* Pacific coast; leaves with 3–5-lobed, pinnatifid leaflets.

2. *R. Ve'rnix (venena'ta).*—Canada, U. S., swamps, 3–6 M. (10–20°) high; leaves of 7–13 entire leaflets; fruit yellow; called poison-sumach, -dogwood, -elder, and yields most toxicodendrol. *R. pu'mila.* S. Ca., procumbent shrub; leaves pinnate with 11 toothed acuminate leaflets; fruit red, hairy. All of these are poisonous, but *R. Vernix* the most so; this so taints the surrounding air that sensitive persons become poisoned by simple exposure to the effluvium.

MASTICHE. MASTIC.

Pistacia Lentiscus, *Linné.* } A concrete resinous exudation.

Habitat. Mediterranean Basin and Islands (Spain, France, Italy, Morocco, Greece, Turkey, Syria, Isle of Scio, Canary Islands, Somali-land, etc.).

Syn. Mastich Tree, Lentisk, Pistacia Galls, Resina Mastiche. Fr. Mastic. Ger. Mastix.

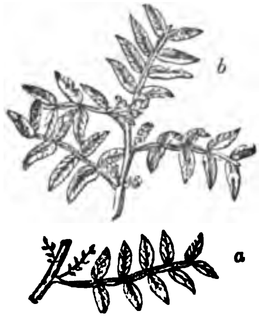
Pis-ta′ci-a. L. fr. Gr. *πιστάκη*, fr. Per. *pistah*, altered from its Ar. name *foustaq, fistaq*, the Pistachio tree (Dioscorides).

Len-tis′cus. L. *lentiscus*, fr. *lens, lentis*, a lenticel, possessing lenticels or elliptical cavities in which the resin secretes.

Mas′tic. Gr. *μαστίχη*, for chewing, to chew, masticatory; *i. e.*, used in the East as a chewing-gum.

PLANT.—Shrub or small tree, 3–4.6 M. (10–15°) high; much branched; bark smooth, brownish-gray; leaves paripinnate; leaflets 3–5 pairs, lanceolate, entire, mucronate, sessile; flowers April–May, diœcious, small; fruit obovate drupe, 6 Mm. (¼′) thick, orange-red. RESIN (mastic), in globular, elongated tears, size of a small pea, sometimes covered with whitish dust, pale-yellow, transparent, glassy lustre, opalescent refraction, brittle, plastic when chewed; odor weak, balsamic, resinous; taste mild, terebinthinate. *Solvents:* chloroform; ether; alcohol dissolves 90 p. c. of it.

FIG. 240.



Pistacia Lentiscus; *a*, staminate plant; *b*, pistillate plant.

ADULTERATIONS.—1. *Resins* from the allied species. 2. *Ca′llitris quadriva′lvis, Sandarac.* N. W. Africa, transparent, glass-like. 3. *Olibanum*, larger, translucent, destitute of glassy lustre. 4. *Sea salt.*

Commercial.—Mastic is collected in northern portions of Scio Islands from the staminate, cultivated plants; it is exported from Scio to Constantinople, Trieste, Vienna, Marseilles, England; while Greece and her other Archipelago Islands could furnish much, they allow it to waste. It secretes in long ducts, with elliptical cavity, located in bast-layer of bark surrounded by layers of small cells, and is obtained by making longitudinal or transverse incisions into the stem and branches during June–July, whereupon juice begins slowly to exude, and is within 2–3 weeks sufficiently hard to be carefully collected in softly lined baskets. We have two varieties: 1. In *separate tears;* collected as such on the bark; it is the best and the official kind. 2. In *agglutinated tears;* this exudes so fast as to run to the ground, being caught on clean tiles, rocks, etc. There are inferior kinds having tears mixed with sand, bark, and gray-brown pieces. The collection is done by women and children, and a healthy plant yields about 10 lbs. (4.5 Kg.).

CONSTITUENTS.—Volatile oil, $C_{10}H_{16}$, 1–2 p. c., Alpha-resin (mastic(h)ic acid), $C_{20}H_{32}O_2$, 90 p. c. soluble in alcohol, Beta-resin (masticin), $C_{20}H_{31}O_2$, white, tenacious, insoluble in alcohol, soluble in ether and oil of turpentine; hot water dissolves the bitter principle.

PREPARATIONS.—1. *Pilulæ Aloes et Mastiches*, gr. ⅔ (.04 Gm.). Dose, 1–3 pills.

PROPERTIES.—Mild stimulant, diuretic, protective (in solution).

USES.—Bronchial and urinary catarrh, filling carious teeth (saturated solution in ether inserted with pressure when ether soon evaporates leaving firm plug), toothache, arrests mild bleeding, masticatory to preserve teeth, fumigation. Dissolved in alcohol or oil of turpentine as a varnish (for maps, etc.), paint, etc.

Allied Plants:

1. *P. mu'tica* (*cabu'lica*) and *P. Khi'njuk, Bombay Mastic.*—N. W. India, Beloochistan. Resembles Scio mastic, but tears more opaque and less clean.

2. *P. Terebi'nthus* (var. *atla'ntica*).—N. Africa, Algeria. Gives a resin resembling mastic.

53. CELASTRACEÆ. Spindle (Staff) Tree Family.

Sel-as-tra'se-e. L. *Celastr-us* + aceæ. Gr. *χήλαστρος*, holly, fr. *celas*, the latter season; *i. e.*, fruit remains on tree all winter. Trees, shrubs. Distinguished by containing an acrid principle; calyx not minute, 4–5-lobed, petals 4–5, imbricate in æstivation; stamens 4–5; ovary sessile, 3–5-celled; fruit colored, 2–5-celled pod, dehiscent, seed in pulpy aril; albuminous, superior; tropics; diuretic, tonic, laxative.

Genus: 1. **Euonymus.**

EUONYMUS. EUONYMUS (WAHOO).

Euonymus atropurpureus, *Jacquin.* } The bark of the root.

Habitat. United States, Ontario to Fla., east of the Mississippi, in shady places.

Syn. Waahoo, Wauhoo, Whahoo, Bursting Heart, Arrow or Indian Arrow Wood, Bitter Ash, Burning Bush, Pegwood, Spindle or Strawberry Tree. Fr. Écorce de Fusain (de Bonnet de Prêtre). Ger. Spillbaumrinde, Pfaffenhütchen.

Eu-on'y-mus. L. fr. G. *εὐ*, well, + *ὄνομα*, name; *i. e.*, well known for poisoning cattle.

A-tro-pur-pu're-us. L. *ater*, dark, + *purpureus*, purple; *i. e.*, red flowers, crimson fruit.

PLANT.—Ornamental shrub 1.5–4.6 M. (5–15°) high, branches slightly quadrangular, wood white; leaves oval, serrate; flowers June, dark-purple cymes; fruit Sept., capsule smooth, 4-lobed. BARK, curved or quilled, 2–5 Mm. ($\frac{1}{12}$–$\frac{1}{5}$') thick, ash-gray, covered with blackish ridges or patches, detached in thin small scales; inner surface whitish, slightly tawny, smooth, fracture smooth, whitish, inner layers striate tangentially; nearly inodorous; taste sweetish afterward bitter and acrid—absorbs moisture, thus losing brittleness. *Solvents:* hot water; diluted alcohol. Dose, ʒss–1 (2–4 Gm.).

CONSTITUENTS.—Euonymin, Atropurpurin, asparagin, euonic acid, (citric, tartaric and malic acids), resins, fixed oil, albumin, wax, starch, ash 14–15 p. c.

Euonymin.—Made by shaking diluted alcoholic tincture with chloroform; separating chloroformic solution and evaporating; purify by treating residue with ether, then alcohol and lead acetate, precipitate by hydrogen sulphide, evaporate. It is yellowish-brown, bitter, amorphous, soluble in ether, alcohol, water. The "Eclectic" resinoid *euonymin* is either brown (from root-bark) or green (from green twigs), both being the precipitate from throwing the evaporated alcoholic tincture into water; instead of this, the extract or powdered extract is sometimes used.

Atropurpurin.—Resembles a glucoside, but is identical with dulcite.

PREPARATIONS.—1. *Extractum Euonymi.* Extract of Euonymus. (Syn., Br. Extractum Euonymi Succum; Fr. Extrait (d'Écorce) de Fusain; Ger. Spillbaumrinden-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. Dose, gr. 1–6 (.06–.4 Gm.).

Unoff. Preps.: Fluid Extract. Dose, ʒss–1 (2–4 Cc.). *Infusion. Decoction,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). Euonymin (appears in action to be identical with podophyllin, only weaker). Dose, gr. ½–3 (.03–.2 Gm.). Euonymin (Eclectic). Dose, gr. 1–6 (.06–.4 Gm.).

PROPERTIES.—Laxative, diuretic, tonic, expectorant, antiperiodic, antiparasitic.

USES.—Should be associated with some of the following drugs; aloes, rhubarb, colocynth, jalap, colchicum, ipecac, nitro-muriatic acid, ammonium phosphate, sodium benzoate, salicylate or phosphate; hence it increases bile flow, promotes other secretions (gastric juice, etc.), and resembles rhubarb, only milder. Good for constipation, dropsy, torpid liver, pulmonary affections, pediculi, but overdoses cause gastro-intestinal irritation; it is excreted by the kidneys and broncho-pulmonary mucous membrane.

Allied Plants:

1. *E. america'nus, Strawberry Bush.*—Low or trailing bush, with crimson capsules. *E. europæ'us.* Common *Spindle-tree* of hedges, 2.5–6 M. (8–20°) high, cultivated, flowers greenish-yellow, capsules pale-red, arillus orange-red; emetic, purgative; both poisonous to cattle.

2. *I'lex verticilla'ta* (*Pri'nos verticilla'tus*), *Prinos, Black Alder, Winter-berry.*—Ilicaceæ. The bark official, 1820–1890; N. America, swamps; shrub, 2–2.5 M. (6–8°) high; leaves serrate, pubescent beneath; flowers white; fruit scarlet berry, size of pea. Bark thin, fragments 1 Mm. ($\frac{1}{25}'$) thick, brown-ash color, with white patches, black dots and lines; inner surface greenish, striate, bitter, astringent. Contains tannin, resin, bitter principle. Used for cinchona, as astringent, tonic, alterative, febrifuge, in diarrhœa, fevers, sores, ulcers, etc. Dose, ʒss–1 (2–4 Gm.), in decoction, fluid extract.

54. SAPINDACEÆ. Soapberry(wort) Family.

Sap-in-da'se-e. L. *Sapind-us* + aceæ, fr. *sap(o)* + *ind(ic)us*, Indian soap; *i. e.,* from its saponaceous fruit. Trees, shrubs, herbs, often twining. Distinguished by presence of a saponaceous principle; ovary usually 3-celled, rarely 2–4, united at base only; leaves compound, often dotted; style undivided or 2–3-cleft; sepals and petals 4–5;

stamens 8–10, distinct or monadelphous, inserted on fleshy disk; fruit fleshy or capsular; seed exalbuminous, superior; tropics; astringent, aromatic, diuretic, diaphoretic, aperient, poisonous; lumber.

Genus: 1. **Paullinia.**

GUARANA. GUARANA.

Paullinia Cupana, *Kunth.* (**P. sorbilis,** *Martius.*) } A dried paste, chiefly consisting of crushed or pounded seeds.

Habitat. N. and W. Brazil.

Syn. Brazilian Cocoa, Guarana Bread. Fr. Guarana. Ger. Pasta Guarana.

Paul-lin′i-a. L. after C. F. Paullini (1643–1712), a German botanist and writer.

Cu-pa′na. L. after Father Francis Cupani, Italian monk and botanist, author; did much work on this family; died 1710.

Sor′bil-is. L. *sorbere,* that which may be sucked or drank; *i. e.*, its use as a potable beverage.

Gua-ra′na. L. of native Brazilian name fr. *guaranis,* a tribe of South American Indians.

PLANT.—Climbing shrub; stem woody, angular; leaves imparipinnate; leaflets 2 pairs and an odd one, 12.5–15 Cm. (5–6′) long, 5–7.5 Cm. (2–3′) wide; flowers yellowish, spicate panicles 10–15 Cm. (4–6′) long; fruit Oct., size of grape, ovoid or pyriform, 6-ribbed; seed 1–3, resembling very small horse-chestnuts, filling the fruit; arillus white, membranous; testa thin, brittle, flattish-convex, brownish-black. PASTE (guarana), in cylindrical sticks or hard masses, dark-reddish-brown, fracture uneven, somewhat glossy, pale-reddish-brown, showing fragments of seeds invested with blackish-brown integuments; odor slight, peculiar, resembling chocolate; taste astringent, bitter; when powdered a fawn-yellow color. *Solvent:* alcohol (75 p. c.). Dose, gr. 15–60 (1–4 Gm.).

Commercial.—To prepare guarana the seeds are deprived of aril, powdered, exposed to the dew or mixed with water to knead into a dough, then made into cylindrical or globular masses and dried by sun or fire.

CONSTITUENTS.—Caffeine (guaranine) 4–5 p. c., Tannin 26 p. c., resin, volatile oil, catechin, saponin, fat, starch, mucilage, ash 2–5 p. c.

Caffeine.—Obtained by boiling powdered paste with litharge and water, adding near the end a few drops of lead subacetate solution to hasten the subsidence of insoluble matter; pass hydrogen sulphide through filtered solution to precipitate lead, evaporate filtered solution to get rid of hydrogen sulphide and sulphur, then let caffeine crystallize out.

Tannin (*paullini-tannic, catechu-tannic acid*).—Precipitates ferric salts (blackish-green), gelatin, alkaloidal and barium salts, but neither tartar emetic nor copper sulphate; reduces silver and gold salts.

PREPARATIONS.—1. *Extractum Guaranæ Fluidum.* Fluid Extract of Guarana. (Syn., Fr. Extrait liquide de Guarana; Ger. Flüssiges Guarana-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 2–5 (.13–.3 Gm.). *Syrup.* Dose, ʒij–4 (8–15 Cc.). *Tincture* (extract 1 part + alcohol 30). Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Nervine, stimulant, tonic, astringent. Similar to coffee, tea, and maté. Produces gayety, restlessness, quick perception, wakefulness; slows pulse, impairs appetite, occasions vesical irritation.

USES.—Chiefly in nervous sick headache (migraine), such as occurs with menstruation or a debauch, attended with bloodshot eyes and throbbing head; diarrhœa of phthisis, convalescence, tonic in general. The native Indians use the powder mixed with cassava or chocolate as a food, or suspend it in sweetened water and allow fermentation to take place, thus furnishing a very popular yellow beverage.

55. RHAMNACEÆ. Buckthorn Family.

Ram-na′se-e. L. *Rhamn-us* + aceæ, Gr. ῥάμνος, the buckthorn, Christ's-thorn, fr. Celtic *ram*, a tuft of branches; *i. e.*, collection of thorns, some species thorny. Trees, shrubs. Distinguished by spiny habit; calyx 4–5-parted; petals and stamens distinct, perigynous, 4–5, opposite each other; sepals valvate; petals involute; ovary 2–5-celled, superior or inferior; fruit dry or fleshy, 2–4-celled, each cell 1-seeded; universal; acrid purgative, bitter tonic, febrifuge, dyes; fruits edible.

Genus: 1. **Rhamnus.**

FRANGULA. FRANGULA (BUCKTHORN).

Rhamnus Frangula, *Linné.* } The bark, collected at least one year before being used.

Habitat. Europe, N. Asia, hedges, bushy places.

Syn. Alder (European) Buckthorn, Black (Alder) Dogwood, Berry Alder, Arrow Wood, Persian Berries. Fr. Écorce de Bourdaine, Bourgène. Ger. Faulbaumrinde.

Rham′nus. L. see etymology, above, of Rhamnaceæ.

Frang′u-la. L. fr. *frango*, to break; *i. e.*, from its brittle stems—its medieval name.

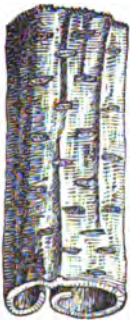
PLANT.—Slender, straggling bush, 3–4.5 M. (10–15°) high; bark smooth, purplish-gray, with white lenticels; branches not terminating in spines, not thorny; leaves oval, entire, 2.5–6 Cm. (1–2½′) long, rounded at base, pointed at apex; flowers May–June, greenish to whitish-pink; fruit July, berry, size of a pea, green, then white, pale-yellow, pink, red and finally black, 2–3-seeded. BARK, in small quills 1 Mm. ($\frac{1}{25}$′) thick, grayish-brown or black, with many whitish, transversely elongated lenticels; inner surface smooth, brownish-yellow; fracture of outer layer short, purplish; inner layer fibrous, pale-yellow; when masticated colors saliva yellow; nearly inodorous; taste sweetish, bitter; moistened with diluted alkali solution (lime water, etc.), the inner surface becomes red; cold water gives yellow, hot water reddish-brown infusion, colored dark-brown by ferric chloride. *Solvent:* diluted alcohol. Dose, ʒss–1 (2–4 Gm.).

ADULTERATIONS.—With barks of allied species.

Commercial.—Obtain bark in the spring from young trunks and large branches, dry carefully; should not be taken from old trunks, as that has different taste and characteristics. The emetic action of green bark is due to an hydrolytic ferment, which is destroyed by heating. Owing to its various European names—black alder, aune noir, schwarzerle, etc.—it is likely to be confused with the genus *Alnus*, to which more properly such names belong.

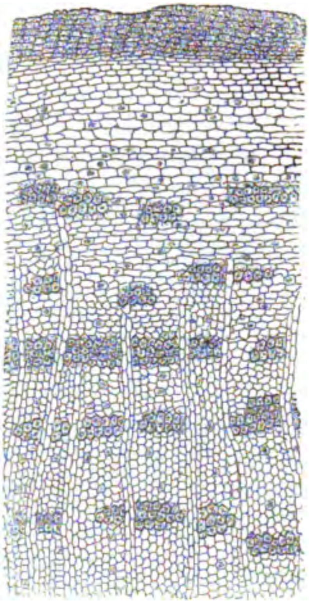
CONSTITUENTS.—Frangulin (rhamnoxanthin) 0.04 p. c., Emodin 0.1 p. c., Isoemodin, frangulic acid, chrysophan, resin, tannin, ash 5–6 p. c.

FIG. 241.



Rhamnus Frangula; bark, natural size.

FIG. 242.



Frangula bark; transverse section, magnified 80 diam.

Frangulin, $C_{21}H_{20}O_9$.—Glucoside, obtained by macerating bark four days in carbon disulphide; evaporate, exhaust residue with alcohol, leaving fat behind, evaporate alcoholic solution to dryness, crystallize from ether. It is in yellow crystals, sublimable, purple by alkalies; dyes cotton, silk, wool, etc., yellow; with hydrochloric acid yields glucose and frangulic (frangulinic) acid, by hydrolysis yields emodin and rhamnose, $C_6H_{12}O_5$, while emodin + rhamnose = frangulin + water, thus (1) $C_{15}H_{10}O_5 + C_6H_{12}O_5 = C_{21}H_{20}O_9 + H_2O$, or (2) $C_{21}H_{20}O_9 + H_2O = C_{15}H_{10}O_5 + C_6H_{12}O_5$.

Emodin, $C_{15}H_{10}O_5$.—In reddish-orange crystals, considered to be trioxymethyl-anthraquinone; also found in aloes, rhubarb, etc.

Isoemodin, $C_{15}H_8O_4$.—Bitter and laxative; fresh bark yields neither frangulin nor emodin, as these develop by age.

Frangulic (Frangulinic) Acid, $C_{14}H_8O_4$.—Glucoside, obtained by boiling alcoholic solution of frangulin with hydrochloric acid; yellowish-brown crystals, aperient like cathartic acid.

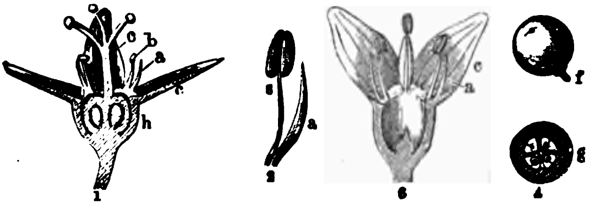
PREPARATIONS.—1. *Extractum Frangulæ Fluidum.* Fluid Extract of Frangula. (Syn., Br. Extractum Rhamni Frangulæ Liquidum; Fr. Extrait liquide (d'Écorce) de Bourdaine; Ger. Flüssiges Faulbaumrinde-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 38 p. c., q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 2–8 (.13–.5 Gm.). *Decoction*, 5 p. c. Dose, ℥ss–1 (15–30 Cc.). *Ointment.*

PROPERTIES.—Purgative, tonic, diuretic. When fresh emetic, severe intestinal irritant, causing much pain, but when modified by age resembles rhubarb or senna, though milder.

FIG. 243.



Rhamnus cathartica; 1–3, the imperfect pistillate and staminate flowers; 2, stamens—*s*, fertile, *a*, sterile; 4, *f*, fruit; *g*, cross-section of fruit.

USES.—In dropsy, costiveness, constipation of pregnancy (fluid extract ♏xx (1.3 Cc.) ter die). Ointment of fresh bark for itch, parasitic skin troubles.

Allied Plants:

1. *Rha'mnus catha'rtica, Buckthorn.*—The berries official, 1820–1840. Europe, N. Asia, naturalized in N. America. Small tree, 3–4.5 M. (10–15°) high, short branches thorny; leaves 2.5–5 Cm. (1–2′) long, 2.5 Cm. (1′) wide; flowers greenish; fruit Sept., black berries, size of a pea, green juice, 3–4-seeded; taste bitter, acrid; contains rhamnocathartin, rhamnin, tannin. Used as a cathartic; in decoction, or expressed juice made into syrup. Fresh juice with alum or lime yields the pigment *sap green.* Dose, ʒij–5 (8–20 Gm.).

2. *R. carolinia'na, Carolina (Southern) Buckthorn.*—New York–Texas. Shrub or small tree; leaves oblong, serrate; flowers short-peduncled; fruit purple, 3-seeded.

RHAMNUS PURSHIANA. CASCARA SAGRADA (CHITTEM BARK).

Rhamnus Purshiana, *De Candolle.* } The bark.

Habitat. N. Idaho, west to the Pacific (N. California).

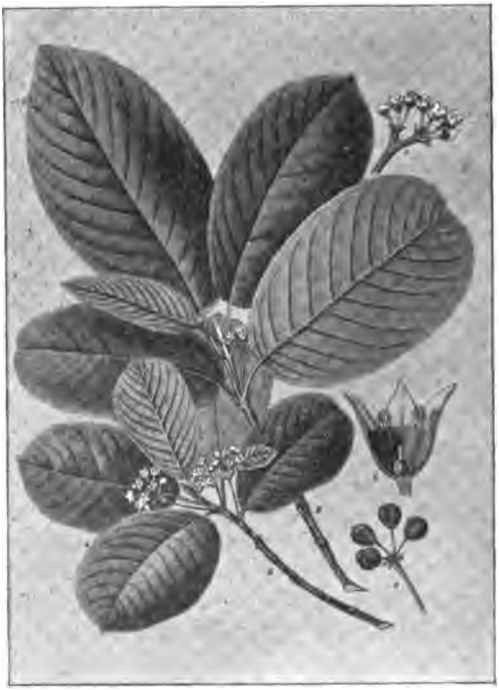
Syn. Sacred—Persian, Persiana or Purchiana Bark, Bearberry, Bear (Shittim) Wood.

Pur-shi-a'na. L. of Pursh, after Fred. Pursh (L. *Purshia*), author *Flora Americæ Septentrionalis*, 1817.

Cas'ca-ra Sa-gra'da. L. Sp. *cascara*, bark, + *sagrada*, sacred—holy bark; *i. e.*, so considered by many natives, on account of its medical properties.

PLANT.—Small tree, 4.5–6 M. (15–20°) high; twigs pubescent; leaves 5–15 Cm. (2–6') long, 2.5–7.5 Cm. (1–3') wide, thin, elliptic, apex obtuse, base rounded, pubescent beneath, dull-green, dentate, petioles short, downy; flowers large, umbellate cymes; fruit drupe, black, obovoid, 8 Mm. ($\frac{1}{3}$') long, 3-lobed, 3-seeded. BARK, curved, quilled, 2.5–10 Cm. (1–4') long, 1–2 Mm. ($\frac{1}{24}$–$\frac{1}{12}$') thick, periderm brownish-gray, whitish, young bark with many broad, paler warts, stone-cells in clusters; inner surface yellowish, by age brownish, smooth or finely striate; fracture short, yellowish, fibrous in the inner layer; colors the saliva yellow, behaves like frangula with alkali

FIG. 244.



Rhamnus Purshiana (Cascara Sagrada); *A*, *B*, flowering branches; 1, flower cluster; 2, flower, vertical section, magnified; 3, fruit.

(red) and ferric chloride (dark-brown); inodorous, bitter. *Solvent:* diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—With barks of allied species.

CONSTITUENTS.—Purshianin (cascarin), rhamnetin, volatile oil, fixed oil, tannin, three resins, (1, brown by potassa, 2, purple by potassa, 3, reddish-brown by sulphuric acid). Composition possibly changes with age; some claim the presence of emodin, chrysarobin and chrysophanic acid, and that from this latter the resins to be derived.

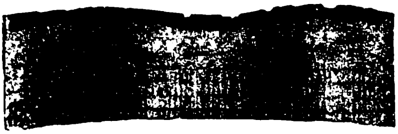
Purshianin.—Crystalline glucoside, brownish-red, odorless, tasteless, soluble in alcohol, acetone, alkalies, hot water, resembles frangulin, but decomposes into emodin and non-fermentable sugar; it is at least five times more active than the drug. Dose, gr. 2–5 (.13–.3 Gm.).

PREPARATIONS.—1. *Extractum Rhamni Purshianæ Fluidum.* Fluid Extract of Rhamnus Purshiana. (Syn., Br. Extractum Cascaræ Sagradæ Liquidum; Fr. Extrait liquide de Cascara Sagrada; Ger. Flüssiges Cascara Sagrada-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

Unoff. Preps.: Tasteless (Aromatic) Fluid Extract (macerate, percolate 100 Gm. + calcined magnesia 12.5, glycyrrhiza 10, with glycerin 25 Cc. + diluted alcohol q. s. 100 Cc.). Dose, ♏x–30 (.6–2 Cc.). *Extract.* Dose, gr. 2–8 (.13–.5 Gm.). *Tincture,* 15 p. c. Dose, ʒss–2 (2–8 Cc.). *Cordial.* Dose, ʒj–2 (4–8 Cc.).

FIG. 245.



Rhamnus Purshiana; transverse section, magnified 10 diam.

PROPERTIES.—Purgative, tonic, febrifuge, increases secretions of stomach, liver, pancreas; not usually given as a single cathartic, but where frequent repetition is required; it operates in 6–10 hours, and wears well, as increased quantities are not needed when habitually used; it regulates action of the bowels, and acts best on empty stomach in concentrated form. Fresh bark gripes, owing to a ferment which in time changes, so that matured official bark and its preparations should be without this property. The purgative action is due largely to resins, tonic to bitter principle.

USES.—Habitual constipation due to simple torpor of the colon, dyspepsia, hemorrhoids.

Allied Plant:

1. *R. califo'rnica.*—California, Mexico. Plant, also locally called "Cascara sagrada," is smaller than *R. Purshiana,* and has bark thinner, with reddish-dull-gray color; leaves elliptical, dentate; flower numerous, abortive; fruit purple, 3-seeded.

56. VITACEÆ. Grape Family.

Vi-ta'se-e. L. *Vit-is* + aceæ, a vine; *viere,* to twist; fr. Cel-[illegible] of plants, while their word *gwin* means wine.

VITACEÆ.

Shrubs, distinguished by climbing by tendrils, having copious watery sap, nodose joints; flowers polygamo-diœcious, calyx 4–5-toothed, petals 4–5, caducous; ovary 1, fruit 1–6-celled berry; temperate climates; astringent, stimulant, nutritious, dietetic, refrigerant, aperient, diuretic.

Genus: 1. **Vitis.**

VITIS. GRAPE.

1. VINUM ALBUM. White Wine.
2. VINUM RUBRUM. Red Wine.

Vitis vinifera, *Linné.* } The fermented juice of fresh fruit.

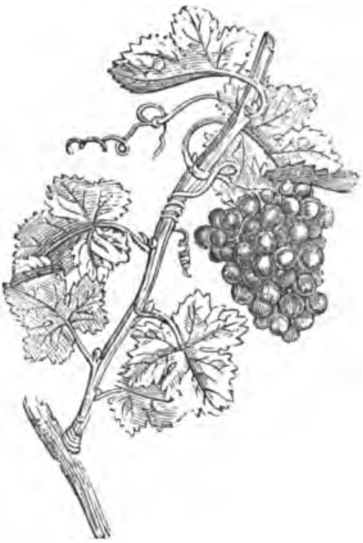
Habitat. W. Asia; cult. in S. Europe, California, Ohio, etc.
Syn. Grape Vine, Vine, Grapes; Fr. Grain de Raisin; Ger. Weinbeere.
Vi′tis. L. see etymology, page 376, of Vitaceæ.
Vi-nif′e-ra. L. *vinum*, wine, +*fero, ferre*, to bear, produce; *i. e.*, its juice produces wine.

PLANT.—Perennial shrub; stem long, tortuous, woody, brownish; leaves 5–10 Cm. (2–4′) long, roundish, 5-lobed, cordate; flowers small, green; fruit, ovoid berry, 12–25 Mm. (½–1′) thick, pericarp thin, green, yellow, purple, red, pulp juicy, greenish, sweet, acidulous; seeds few, pyriform.

CONSTITUENTS. — GRAPES: Sugar 12–30 p. c. (most in warm climates), potassium bitartrate, calcium tartrate, calcium phosphate, potassium sulphate, sodium chloride, tannic acid, malic acid, racemic acid, ferments, albumin, gluten, pectin, extractive, magnesia, alumina, silica.

Potassii Bitartras, Potassium Bitartrate (Cream of Tartar), $KHC_4H_4O_6$, *official.*—Obtained from argol or tartar (impure acid potassium tartrate, this being the precipitate formed during the fermentation of grape juice into wine), by boiling it in water, filtering through charcoal, crystallizing.

FIG. 246.



Vitis vinifera, in fruit.

Acidum Tartaricum, Tartaric Acid, $H_2C_4H_4O_6$, *official.*—Obtained from argol by boiling in water, neutralizing with chalk, decomposing with calcium chloride, boiling with sulphuric acid, crystallizing.

1. *Vinum Album.* White Wine. (Syn. Vinum Generosum Album; Fr. Vin blanc; Ger. Weiss Wein.) An alcoholic liquid made by fermenting the juice of fresh grapes, freed from seeds, stems, and skins. It is a pale-amber or straw-colored liquid, pleasant odor, free from

yeastiness, fruity, agreeable, spirituous taste, without excessive sweetness or acidity, sp. gr. 0.995.

2. *Vinum Rubrum.* Red Wine. (Syn., Fr. Vin rouge ; Ger. Roth Wein.)

An alcoholic liquid made by fermenting the juice of fresh, colored grapes in the presence of their skins. It is a deep-red liquid, pleasant odor, free from yeastiness, taste fruity, astringent, pleasant, acidulous, without excessive sweetness or acidity, sp. gr. 0.995.

Impurities.—White Wine: Tannic acid, free acid; Red Wine: Tannic acid, free acid, aniline colors, fuchsine, sulpho-fuchsine.

Assay.—Both white and red wine should yield 10–14 p. c. by weight, or 12.4–17.3 p. c. by volume of absolute alcohol, and they should be preserved in well-closed casks, full as possible, or in well-stoppered bottles in a cool place.

Commercial.—The many varieties of grapes are not all of one botanic source. Thus most American wines are from the cultivated forms of *Vitis Labru'sca*—Catawba, Concord, Isabella, while *Vitis æstiva'lis* gives us the Clinton, *Vitis cordifo'lia* or *Vitis vulpi'na* (*ripa'ria*) the Delaware, and *Vitis vulpi'na* the Scuppernong. On the other hand, quite all European wines are from *Vitis vinifera* varieties, which, having been introduced into California, etc., furnish us much valuable wine, in fact products difficult to distinguish from foreign vintage.

Grapes are first crushed, and the clear juice, "must," is fermented, giving light-colored wine, and, if husks, seeds, etc., be left in, dark-colored wine. The fermentation requires two or three weeks before the solution becomes clear, when it is put into other vessels, and slow after-fermentation allowed to continue for several weeks or months, during which time considerable precipitation takes place (argol, etc.). At the end of this process it is placed into casks to ripen, and to obtain the "bouquet," which is much improved after bottling. Clarification is aided by gelatin, as this combines with tannin to form an insoluble compound and carries down with it yeast and other suspended matter. If the "must" has moderate amount of sugar, we get dry wine, if very much sugar the fermentation ceases before it is all consumed, yielding thereby sweet wine; when bottled before the after-fermentation, the product becomes sparkling wine or champagne.

White wines are from pale-yellow to deep-amber, differ from the red in having very little color and tannin, and include the Sherry, Lisbon, Teneriffe, Madeira, Rhenish, Hock, Moselle, French, California, etc. When white wine is prescribed without further specification a dry domestic production should be used, such as California, Riesling, Ohio, Catawba. When red wine is prescribed without further specification a dry domestic production should be employed, such as Claret, Burgundy, etc.

PROPERTIES.—Stimulant, depressant, astringent, tonic, diaphoretic. The red wine contains most tannin, is more tonic and sustaining, less excitant, and is to be solely used in convalescence, excessive discharges of blood, pus, etc.; these are much more adulterated than white wines, and to the healthy are not only useless but absolutely pernicious, unless extremely light, as some of those made in France. Wines like Sherry, Port, Madeira, etc., should not even be moderately indulged in as they induce gout, apoplexy, dropsy, tremors, stomach and liver troubles, as well as other complaints caused by over-stimulation.

USES.—Fevers, typhus, etc., ulceration, gangrene, tetanus, pure debility, irritable stomach, debility of the aged, etc.

57. MALVACEÆ. Mallow Family.

Mal-va'se-e. L. *Malv-a* + aceæ, fem. pl. of *malvaceus*, of mallows; *malva*, mallow, fr. Gr. *μαλακός*, soft, mild; *i. e.*, owing to its emollient properties or soft, downy leaves. Herbs, shrubs, trees. Distinguished by stamens monadelphous, anthers 1-celled, seed reniform; flowers regular; sepals 5; petals 5; pistils several, united; albuminous, superior; temperate climate, tropics; demulcent, tough fibres, hairs as cotton.

Genera: 1. **Althæa.** 2. **Gossypium.**

ALTHÆA. ALTHÆA (MARSH-MALLOW).

Althæa officinalis, *Linné.* } The root, collected in autumn from (cultivated) plants at least two years old.

Habitat. Europe, Western and Northern Asia. Naturalized in salt marshes. New England, New York, Australia, cultivated in Europe.

Syn. White Mallow, Mortification root, Sweet weed, Wymote. Fr. Racine de Guimauve, Guimauve. Ger. Radix Althææ, Eibischwurzel, Eibisch.

Al-thæ'a. L. fr. Gr. *ἀλθεῖν*, to heal, cure; *i. e.*, its medicinal qualities (Dioscorides).

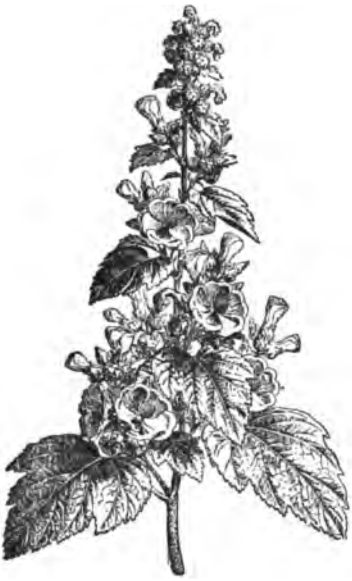
Of-fi-ci-na'lis. L. see (*Asagræa*) *officinalis*, page 95.

PLANT.—Perennial herb .6–1.3 M. (2–4°) high, having several woolly stems; leaves 2.5–7.5 Cm. (1–3′) long, serrate, both sides pubescent; flowers large, 2.5–5 Cm. (1–2′) in diameter, purple; ROOT, in cylindrical pieces, peeled, 7.5–15 Cm. (3–6′) long, 10 Mm. ($\frac{2}{5}$′) thick, whitish, hairy from the loosened bast-fibres, medullary rays narrow; vascular bundles, small, indistinct; parenchyma filled with starch and contains scattered cells of calcium oxalate crystals, also larger cells of mucilage; odor faint, aromatic, taste sweet, mucilaginous; unscraped roots yellowish-brown, non-fibrous. Leaves and flowers are sometimes used. *Solvents:* water is best which, when cold, dissolves asparagin, mucilage, and sugar, when hot also takes up starch. Dose, ʒss–1 (2–4 Gm.).

ADULTERATIONS.—Belladonna root, when young and peeled, resembles althæa, but is distinguished by the absence of hair-like bast-fibres, and by having visible yellowish wood-bundles. Old, dark-colored althæa roots are sometimes whitened by calcium oxide or sulphate, which is detected by soaking in water, when calcium salts subside to the bottom.

CONSTITUENTS.—Asparagin (althein, amido-succinamic acid, asparamide) 1–2 p. c., Mucilage (bassorin, althæa mucilage, upon which value depends) 35 p. c., Starch 35 p. c., pectin 10 p. c., betaine, sugar 8 p. c., ash 4–5 p. c.

FIG. 247.



Althæa officinalis.

Asparagin, $C_4H_8N_2O_3 + H_2O$.—Obtained by putting the thick, viscid mucilage of althæa into a dialyzer, with water outside; asparagin passes into the water, which upon evaporation yields the crystals. These are colorless, neutral, transparent, lustrous, sp. gr. 1.520, soluble in water 47 parts, acids, alkalies, converted by these latter into ammonia and organic acid; therapeutically inactive. Dose, gr. 5–10 (.3–.6 Gm.).

PREPARATIONS.—1. *Syrupus Althææ.* Syrup of Althæa. (Syn., Syrup of Marsh-Mallow; Fr. Sirop de Guimauve; Ger. Eibischsirup.)

Manufacture: 5 p. c. Macerate 5 Gm. in water 40 Cc. + alcohol 3, for one hour, dissolve in strained solution sugar 10 Gm., add glycerin 10 Cc., water q. s. 100 Cc. Dose, *ad libitum.*

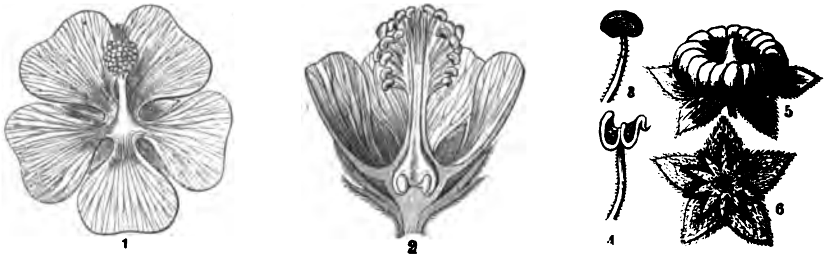
2. *Massa Hydrargyri,* 25 p. c. Dose, gr. 1–15 (.06–1 Gm.).

3. *Pilulæ Ferri Carbonatis,* gr. $\frac{1}{6}$ (.01 Gm.) in each pill. Dose, 1–3 pills.

4. *Pilulæ Phosphori,* gr. 1 (.06 Gm.) in each pill. Dose, 1–5 pills.

Unoff. Preps.: Decoction, 5 p. c. *Ointment. Poultice. Species Althæa. Species Emollientes. Species Pectorales.*

FIG. 248.



Althæa officinalis; 1, expanded flower; 2, vertical section of flower; 3, stamen; 4, stamen after discharge of pollen; 5, fruit; 6, outside calyx as seen from beneath.

PROPERTIES.—Demulcent, emollient, protective.

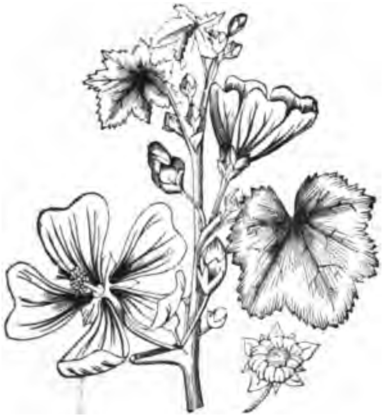
USES.—Inflammations of pulmonary, digestive, and urinary organs, mucous membranes; skin eruptions, herpes, psoriasis, enema (decoction) for vaginal and rectal irritation.

In pharmacy, the powdered root being very absorbent, is used to harden pills, troches, electuaries, etc.

Allied Plants:

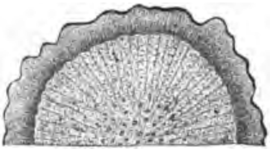
1. *A. ro'sea, Hollyhock.*—Levant. Petals used; frequently cultivated in gardens. Flowers (*Flores Malvæ Arboreæ*) 7.5–12.5 Cm. (3–5′) broad, nearly sessile, composed of a tomentose calyx and 5 purple petals.

FIG. 249.



Malva sylvestris; showing flowers, leaves, and fruit.

FIG. 250.



Althæa; transverse section, magnified 2 diam.

2. *Ma'lva sylve'stris, High Mallow; M. vulga'ris, Common Mallow,* and *M. rotundifo'lia, Low (Running) Mallow.*—The flowers are rose-red, purple or whitish, but when dried bluish, green with ammonia, red with acids, slight odor; sweetish, mucilaginous taste.

3. *Abu'tilon* and *Hibi'scus* species have similar medical properties, and can be used satisfactorily one for the other.

GOSSYPIUM. COTTON.

1. GOSSYPII RADICIS CORTEX. Cotton Root Bark.
2. GOSSYPIUM PURIFICATUM. Purified Cotton.
3. OLEUM GOSSYPII SEMINIS. Cotton-Seed Oil.

Gossypium herbaceum, *Linné,* and other species.	1. The bark of the root. 2. The hairs of the seed, freed from adhering impurities and fat. 3. The fixed oil, expressed from the seed and purified.

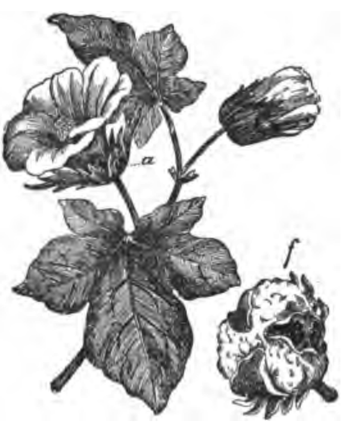
Habitat. C. Asia, India, China, Arabia, N. E. Africa, Egypt, cultivated in the United States, W. Indies, C. and S. America, N. Africa, Australia, S. Spain, etc.

Syn. 1. Fr. Écorce de la Racine de Cotonnier. Ger. Baumwoll-wurzelrinde. 2. Gossypium, Absorbent Cotton, Cotton Wool. Fr. Bombyx, Lana (Lanugo, s. Pili) Gossypii; Coton. Ger. Baumwolle. 3. Fr. Huile (de Coton) de Semences de Cotonnier. Ger. Baumwollsamenöl.

Gos-syp′i-um. L. fr. Ar. *Goz, Gothn,* a soft silky substance; *i. e.,* the hairs of the seeds.
Her-ba′ce-um. L. *herbaceus,* grassy, herby; *i. e.,* the plant habit.

PLANT.—Small biennial or triennial shrub; stem branching, 1.5–3 M. (5–10°) high, more or less woody; leaves hoary, palmately 3–5-lobed; flowers large, 5–7.5 Cm. (2–3′) long and wide, yellow, purple spot near the claw; fruit capsule or boll 4–5 Cm. (1½–2′) long, 3–5-celled, opening by as many valves when ripe, revealing loose, white tuft of long, slender hair that surrounds each one of the numerous seeds. BARK OF THE ROOT, in thin, flexible bands or quills, brownish-yellow, slightly ridged, with black dots or short transverse lines and dull-orange-brown patches from the abrasion of the thin cork; inner surface whitish, silky lustre, finely striate; bast-fibres tough, long, separable into papery layers; inodorous; taste slightly acrid, astringent. *Solvents:* diluted alcohol; boiling water. Dose, ʒss–1 (2–4 Gm.). HAIRS OF THE SEED, white, soft, fine filaments 12–37.5 Mm. (½–1½′) long; under microscope hollow, flattened, twisted bands, spirally striate, slightly thickened at edges; inodorous, tasteless. *Test:* When compressed in the hand and thrown on water, should quickly sink and impart to the water neither acidity nor alkalinity; ash should be no greater than 0.8 p. c. *Solvent:* solution of copper ammonium sulphate. OIL OF THE SEED, pale-yellow, nutritious, oily liquid, odorless; bland, nut-like taste; sp. gr. 0.920–0.930; sparingly soluble in alcohol, readily in ether and chloroform; solidifies at − 2° C. (28° F.). *Tests:* 1. Mercuric nitrate solidifies olive oil, but leaves cotton-seed oil fluid; 2. With sulphuric or nitric acid get brownish-red, but no coloration with olive oil.

FIG. 251.



Gossypium herbaceum; *a*, outside calyx; *f*, fruit.

SUBSTITUTIONS.—1. BARK: That from the stem sometimes employed. 2. HAIRS: *Bœhme′ria ni′vea,* fibre can be used for cotton, lint, etc. 3. OIL: 1. Brazil or Para Nut oil; nuts 2.5–5 Cm. (1–2′) long, three-edged, brownish-gray kernel, white, almond-taste; yield 60 p. c. oil. 2. Oleum Fagi, Beech Oil, from fruit of *Fa′gus sylva′tica,* kernels yield 22 p. c. oil; yellow, sp. gr. 0.922, congeals at −17.5° C. (0° F.).

Commercial.—Cotton was known by Arabians, Egyptians, and Chinese in the tenth century, was carried to Spain by Moors in the sixteenth century. Ancient Egyptians possibly did not know it, as their mummy fibres are all linen. No paintings of plants nor seeds are found in tombs. In Peru, however, mummy clothing contains cotton from earliest date, hence here may be its original habitat. There are many species now giving similar products. Our own is thought to be from *G. barbade'nse*, Barbadoes Island, West Indies. Chapman refers long staple or Sea Island cotton, which we cultivate, to *G. ni'grum*, and short staple or Upland cotton to *G. a'lbum*.

The Bark is taken from the washed roots in late fall with knives and dried in the sun for market; sometimes the entire root is included.

The Hairs are taken from the seeds by hand or mill (cotton gin). As the seeds contain 15–20 p. c. fixed oil, some of this in growing is absorbed by the fibres, which must be removed before serving well in medicine. Purification: Boil carded cotton in a 5 p. c. solution of potassa or soda, wash with water to remove soap, express, and add to it a 5 p. c. solution of chlorinated lime for half an hour, wash, express, and add it to acidulated (HCl 5 p. c.) water, wash, express. This process may be repeated if necessary and removes 7–10 p. c. of weight, being chiefly fat.

The Oil is obtained by cracking off testa, grinding kernels, and expressing; yield 15–21 p. c. At first thick, reddish-brown, turbid from mucilage and albumin; by standing most of this subsides, yielding *clarified oil* of orange color, by treating this with boiling water or super-heated steam albuminoids are coagulated, giving lighter-colored *refined oil*, finally by bleaching, which consists in agitating with alkaline solution and heating, we get *winter-bleached oil*. The loss in refining is 5–10 p. c., and thus purified it is official. It is largely exported for olive oil adulteration, toward which end a line of tanked steamers ply regularly between New Orleans and Europe, the vessels having a capacity of from one-half to one million gallons or 12,000–20,000 barrels (189–378 Ml.).

CONSTITUENTS.—I. BARK: Chromogene (yellow, becoming red and resinous by age), resin (yellow), fixed oil, tannin, sugar, starch, ash 4 p. c. II. HAIRS: Cellulose, inorganics 1.5 p. c., fixed oil 7–10 p. c. III. OIL: Olein, palmitin and non-saponifiable yellow coloring matter.

PREPARATIONS.—I. BARK: 1. *Extractum Gossypii Radicis Fluidum*. Fluid Extract of Cotton Root Bark. (Syn., Fr. Extrait liquide d'Écorce de Cotonnier; Ger. Flüssiges Baumwollwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 Cc. + glycerin 25, finishing with the former alone q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Decoction, ℥iv (120 Gm.) + Oij (900 Cc.) evaporated to Oj (450 Cc.). Dose, ℥ij (60 Cc.) every half hour.

II. HAIRS: 1. *Pyroxylinum*. Pyroxylin. Soluble Gun Cotton, Colloxylin. (Syn., Collodion Cotton, Lana Collodii; Fr. Fulmicoton soluble; Ger. Kollodiumwolle.)

Manufacture: Immerse purified cotton 100 Gm. in a mixture of sulphuric acid 2,200 Cc. + nitric acid 1,400 Cc.; wash with much water, then alcohol, and press, to make it soluble in a mixture of alcohol 1 volume + ether 3 volumes; when thus prepared, wash with cold then boiling water, and dry at 60° C. (140° F.). Should be kept cool, dry, remote from lights, fire, and loosely packed in well-closed vessels of 25 Gm. each.

Prep.: 1. *Collodium.* Collodion. (Syn., Fr. Collodion; Ger. Collodium, Kollodium.)

Manufacture: Add to pyroxylin 3 Gm., ether 75 Cc.; after fifteen minutes add alcohol 25 Cc., let stand until clear.

Prep.: 1. *Collodium Stypticum.* Styptic Collodion. (Syn., Collodium Hæmostaticum, Styptic Colloid, Xylostyptic Ether; Fr. Collodion au Tannin, Collodion styptique; Ger. Tannin Collodium.)

Manufacture: Agitate in a bottle tannic acid 20 Gm., alcohol 5 Cc., ether 25, adding finally collodion q. s. 100 Cc.

2. *Collodium Flexile.* Flexible Collodion. (Syn., Fr. Collodion élastique; Ger. Collodium Elasticum, Elastisches Collodium.)

Manufacture: Mix thoroughly in a bottle collodion 92 Gm., Canada turpentine 5, castor oil 3.

Prep.: 1. *Collodium Cantharidatum.* Cantharidal Collodion. Blistering Collodion. (Syn., Collodium (Vesicans) Cantharidale; Fr. Collodion (vésicant) cantharidé—cantharidal; Ger. Blasenziehendes Collodium, Spanischfliegen (Kanthariden)-Kollodium.)

Manufacture: Percolate cantharides 60 Gm., with chloroform until exhausted, reclaim and evaporate to 15 Gm., dissolve this in flexible collodion 85 Gm., set aside to clear. Keep all collodions with same precaution as pyroxylin.

Unoff. Preps.: Salicylated, borated, benzoinated, chlorinated, carbolated, iodoform, hæmostatic cottons.

III. OIL: 1. *Linimentum Ammoniæ,* 60 p. c.

2. *Linimentum Camphoræ,* 80 p. c.

PROPERTIES.—I. BARK: Emmenagogue, oxytocic, uterine hæmostatic; similar to ergot, but less certain. II. HAIRS: Protective. III. OIL: Demulcent, nutrient.

USES.—I. BARK: Dysmenorrhœa, amenorrhœa, uterine tumors, southward for abortions, uterine hemorrhages. *Incompatibles* and *Synergists:* Same as for ergot. II. HAIRS: Dressing in burns, scalds, erysipelas, blisters, surgical wounds; keeps out organic germs that cause suppuration and septic disease. Cotton batting maintains local heat in pneumonia, rheumatism, and can be made into pessaries. III. OIL: Like olive and almond oils in pharmacy, liniments, etc.; in culinary for lard—to adulterate olive oil, in preparing woollen cloth, morocco leather, lubricating machinery, etc.

Cotton-seed Tea is a mucilaginous drink for dysentery and diarrhœa.

Allied Plants:

1. *G. barbade'nse, G. arbo'reum, G. religio'sum* (fibres yellow), etc. —These furnish products which can be used similarly to the official.

58. STERCULIACEÆ. Silk Cotton Family.

Ster-ku-li-a'se-e. L. *Sterculi-a* + aceæ, from *stercus*, excrement, *Sterculius*—God of; *i. e.*, named from the fetid flowers or fruit of certain species. Trees or shrubs. Distinguished from Malvaceæ by anthers 2-celled and flowers sometimes unisexual by abortion; calyx 5, corolla 5, twisted; tropics, temperate climates; demulcent, emetic, purgative.

Genus: 1. **Theobroma.**

THEOBROMA. CACAO (CHOCOLATE TREE).

Oleum Theobromatis. Oil of Theobroma (Oleum Theobromæ. Butter of Cacao), *official.*

Theobroma Cacao, *Linné.* } A fixed oil, expressed from the seed.

Habitat. South America, Brazil, Central America, Mexico, West Indies. Cultivated in the tropics, largely in some of the West Indies.

Syn. Semen (Fabæ) Cacao. Fr. Cacao, Fèves du Mexique. Ger. Kakaobohnen. Fr. Oleum Concretum e Semine Theobromæ Cacao, Beurre de Cacao. Ger. Oleum Cacao, Kakaobutter.

The-o-bro'ma. L. fr. Gr. θεός, a god, + βρῶμα, food—food of the gods; *i. e.*, its delicious qualities.

Ca-ca'o. L. Sp. from Mexico, *kakahuati; i. e.*, its native name.

PLANT.—Handsome tree 9–12 M. (30–40°) high, round branches, bark gray, smooth; leaves 20–22.5 Cm. (8–9') long, 6 Cm. (2½') wide, lanceolate, acute, round base, entire, veins prominent beneath, petiole 2.5 Cm. (1') long, thickened at both ends; young leaves pink; flowers pale-pink, calyx and corolla 2.5 Cm. (1') broad, alike in color; fruit large, 15–17.5 Cm. (6–7') long, broadly fusiform, with 10 shallow furrows and blunt ridges, tuberculated, pendulous, single or 2–3 together, at first yellow, then red, purple, pericarp thick, tough, 5-celled; seeds many, closely packed in tiers, size of almonds, angular from pressure, immersed in copious, sweet buttery pulp, seed-coats two, brownish.

CONSTITUENTS.—SEEDS: Fixed oil 50 p. c., starch 16 p. c., theobromine 1.5–4.5 p. c., caffeine, proteids 18 p. c., sugar 0.6 p. c., coloring matter, ash 3.6–4.6 p. c.

Oleum Theobromatis. Oil of Theobroma.—The seeds, taken from the fruit, are dried, thus retaining astringency and bitterness, or preferably are allowed to sweat and ferment in heaps for a week, then dried, thus losing astringency and bitterness; this can also be done by burying in a box for three days. The oil is now extracted by: 1. Expression, 2. Decoction, 3. Solvent (carbon disulphide, ether, chloroform, etc.). The former process is considered best and consists in warming the seeds and subjecting them to hydraulic pressure or feeding them through heated rollers. Thus nearly all the oil is squeezed out from a dryish, oleaginous pulp (expressed cake).

Oil is a yellowish solid, faint, agreeable odor, bland, chocolate-like taste, sp. gr. 0.975, melts at 30–33° C. (86–91.4° F.) soluble in ether, chloroform, etc. Contains stearin, laurin, arachin, olein, with glycerides of formic and butyric acids, little resin. *Test:* Oil 1 Gm. + 3 Cc. ether or benzin, in test tube at 17° C. (63° F.); when dissolved plunge into water at 0° C. (32° F.), the liquid should not become turbid, nor deposit a granular mass in less than three minutes, and after congealing should clarify at 15° C.; 59° F. (abs. paraffin, wax, stearin, tallow, etc.). Dose, ʒss–1 (2–4 Gm.).

PREPARATIONS.—(Unoff.) *Emulsion, Suppositories, Ointments.*

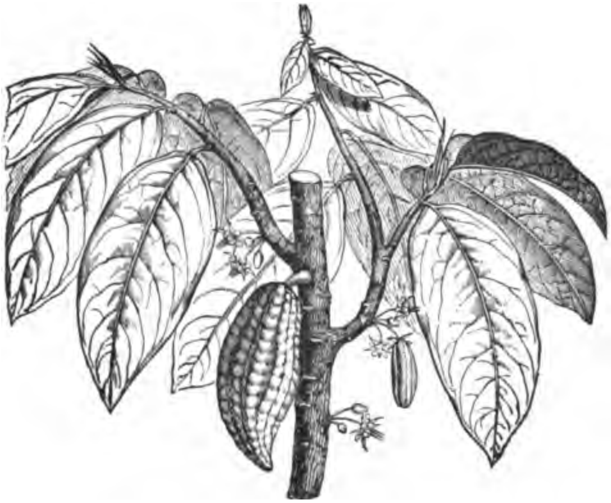
PROPERTIES.—Nutrient, demulcent, emollient.

USES.—Seldom internally, only as suppositories, when it acts as an excipient or carrier for other medicine. Externally in cosmetic ointments, pill coating, abraded or inflamed surfaces.

Allied Products:

1. *Chocolate, Cocoa.*—In every 100 parts of seeds 12 are shells, 88 are kernels; now the expressed cake, preferably from seeds, having been deprived of testa before pressing, when reduced to paste, mixed with sugar, vanilla, cinnamon, etc., annotto for coloring, and moulded into cakes, constitutes commercial *cacao, cocoa* or *chocolate* (fr. Indian, *chocolat*). To this sometimes are added starch, rice flour, butter, lard, barley flour, sassafras nuts, cloves, etc., mainly as adulterants.

FIG. 252.



Theobroma Cacao.

2. *Theobromine* (dimethylxanthine), $C_7H_8N_4O_2$.—To obtain this exhaust kernels with hot water, strain, precipitate with lead acetate, filter, remove lead by hydrogen sulphide, filter, evaporate, now treat residue with hot alcohol, from which whitish bitter crystals deposit. It is an alkaloid not altered by solution of potassa, slightly soluble in water, alcohol, ether, forms salts (hydrochlorate, nitrate, salicylate, etc.), and is related to caffeine, this latter being its methyl derivative—methyl-

theobromine, into which theobromine may be converted by treating theobromine-silver with methyl-iodide.

Theobromine is also made synthetically from xanthine (ureous acid); the salt, *sodio-theobromine salicylate* (diuretin) containing 49.7 p. c. of this alkaloid is a stimulant and diuretic in chronic and acute Bright's disease, the dose being gr. 10–20 (.6–1.3 Gm.) ter die in capsule or solution.

Allied Plant:

1. *Co'la acumina'ta, Cola Nut.*—W. Africa, S. America. A large African tree, having yellow flowers which produce 5 follicles, each 1-seeded; these are 2.5 Cm. (1') long, somewhat flattened, brownish with blackish spots, nutmeg-odor, aromatic taste. Contain caffeine 2 p. c., theobromine, starch 42 p. c., kolanin, kolazym, (ferment), tannin, sugar and gum 11 p. c., proteids 6 p. c., fat, volatile oil 1.5 p. c. Properties and uses the same as coffee (but resembles coca in aiding the endurance of fatigue without food). Even the nuts are roasted and used similarly in stimulating beverage.

59. THEACEÆ (TERNSTRŒMIACEÆ). Tea Family.

The-a'se-e. L. *The-a* + aceæ, tea, fr. Chinese *Tĕh* or *Toha; i. e.*, native name assimulating *Dea*, God. Trees, shrubs. Distinguished by alternate leaves; large showy solitary axillary flowers, sepals 5, petals 5, crenulate, stamens monadelphous; ovary 2–several-celled, superior; fruit 3–5-celled, woody capsule, dehiscent; tropics; stimulant, astringent, sedative.

Genus: 1. **Thea.**

THEA. TEA.

Caffeina, Caffeine (Theine), $C_8H_{10}N_4O_2 + H_2O$, *official.*

Thea sinensis, *Linné,* and **Coffea arabica,** *Linné.*	A feeble basic proximate principle from the dried leaves of the former, and dried seeds of the latter (Rubiaceæ), and found also in other plants.

Habitat. S. E. Asia, China, India, Japan; cultivated.

Syn. Thea Bohea, Black Tea, Thea viridis, Green Tea; Fr. The; Gr. Thee.

The'a. L. see etymology, above, of Theaceæ.

Si-nen'sis. L. (Chinensis) Chinese, of or belonging to China; *i. e.,* its chief habitat.

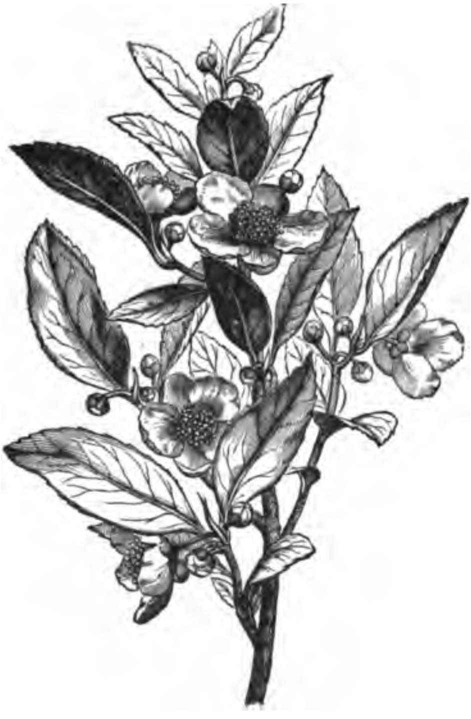
Plant.—Evergreen shrub, much branched, bark brown, young twigs downy; leaves 5–10 Cm. (2–4') long, petiolate, acute at both ends, oval, irregularly serrate, veins prominent, dark-green; flowers in winter, 2.5 Cm. (1') wide, yellowish-white; fruit 3-celled trigonous capsule, with thin brown woody pericarp; diluted alcohol or boiling water exhausts the leaves. Dose, ʒj–2 (4–8 Gm.).

Adulterations.—Prussian blue, indigo, turmeric, gypsum; the three former impart color to water, the latter soon deposits; various leaves, recognized by shape, venation, margin, etc.

Commercial.—The plant, springing from seed, begins to yield satisfactory leaves in three years, and at seven attains perfection, being about the height of a man. Three collections are made yearly (Feb., Apr., June), the first, consisting mostly of young leaves, having greatest value. Commercially we have *green* and *black*, the former being more carefully collected and quickly dried, the latter, owing to slower process, undergoing partial fermentation, thereby changing color and sacrificing quality.

CONSTITUENTS.—Caffeine (Theine) 1–5 p. c., volatile oil 0.6–1 p. c., theophylline (isomeric with theobromine), tannin 11–21 p. c., boheic acid, albumin, resin, wax, ash 4–6 p. c. (14 p. c. being phosphoric acid); leaves yield 40 p. c. of aqueous extract.

FIG. 253.



Thea sinensis.

PREPARATIONS. — (Unoff.) *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Infusion (Tea).* Dose, *ad libitum.*

PROPERTIES AND USES. —Similar to coffee, under Rubiaceæ, which see.

Allied Plants:

1. *The'a* (*Came'llia,* after George Joseph Camel or Camelli, a Dutch Jesuit missionary and botanist) *japo'nica.*—Japan. An ornamental shrub with poisonous seed. *T. oleo'sa* (*Came'llia olei'fera*) and *T. drupi'fera.* Seeds resemble those of *T. sine'nsis* and yield a bland fixed oil, that of *T. drupi'fera* being fragrant.

2. *I'lex parague'nsis* (*paraguaye'nsis*), *Maté, Paraguay Tea.*—Ilicaceæ (Aquifoliaceæ). Brazil. Leaves contain caffeine 0.2–1.6 p. c., tannin 10–16 p. c., volatile oil, stearopten, wax, glucoside, proteids 5 p. c., ash 4–8 p. c.

3. *Helia'nthemum canade'nse, Frostwort.*—Cistaceæ. The herb official, 1850–1880; N. America. Perennial, 15–45 Cm. (6–18′) high, hoary; leaves 2.5 Cm. (1′) long, woolly beneath; flowers 2.5 Cm. (1′) broad, yellow, 5's, calyx pubescent, bitter, astringent. Contains tannin 11 p. c., bitter glucoside. Used as a tonic, astringent, alterative for scrofula, syphilis, diarrhœa; gargle in scarlatina, sore-throat, prurigo; large doses emetic. Dose, gr. 5–30 (.3–2 Gm.); in decoction, infusion, extract.

60. GUTTIFERÆ (CLUSIACEÆ). Gamboge (Mangosteen) Family.

Gu-tif′e-re. L. fem. pl. *Guttifer—gutta*, a drop, + *ferre*, to bear; *i. e.*, plants yield gum or resinous substances (juice) in drops. Trees or shrubs, allied to Hypericaceæ and Malvaceæ. Leaves coriaceous; flowers perfect; stamens many, distinct, mon- or poly-adelphous; sepals 2–8, often unequal, petaloid; petals 2–8 × ; ovary 1-celled, superior; fruit edible; seed oily; tropics; purgative, timber.

Genus: 1. **Garcinia.**

CAMBOGIA. GAMBOGE.

Garcinia Hanburii, *Hooker filius.* } A gum-resin.

Habitat. Anam, Camboja (Cambodia), Siam. Cochin-China.

Syn. Gummi-resina—Guttæ or Gutti, Gutta Gamba, Cambodia. Fr. Gutte, Gomme-gutte. Ger. Gummigutt, Gutti.

Gar-cin′i-a. L. named after Laurent Garcin, French botanist, who first described it in 1734.

Han-bu′ri-i. L. in memory of D. Hanbury, named by Sir J. D. Hooker.

Cam-bo′gi-a. L. usually called Cambodia, a French protectorate in farther India, where it is indigenous.

Gamboge. The trade name, corruption of Camboge.

Plant.—A tree 10.5–15 M. (35–50°) high, with many spreading branches; bark orange-brown, thick; leaves 10–17.5 Cm. (4–7′) long, laurel-like; flowers Feb., diœcious, small, yellow, in 4's, staminate ones on pedicels (*pedicula′ta*) 6 Mm. (¼′) long; fruit May–June, size of crab apple, 3 Cm. (1¼′) in diameter; smooth, orange-green color, with 4 dissepiments, each having one seed 12–18 Mm. (½–¾′) long. Gum-resin (gamboge), in cylindrical pieces, straight or bent, solid or hollow, 15–20 Cm. (6–8′) long, 2.5–5 Cm. (1–2′) thick, longitudinal striæ, fracture conchoidal, waxy lustre, orange-red; inodorous; taste acrid; powder bright-yellow, sternutatory. *Solvents:* alcohol or ether extract at least 75 p. c. Dose, gr. ½–5 (.03–.3 Gm.).

Adulterations.—Wheat and rice flour, sand, powdered wood or bark, mostly in the cake variety, giving greater hardness and coarser fracture.

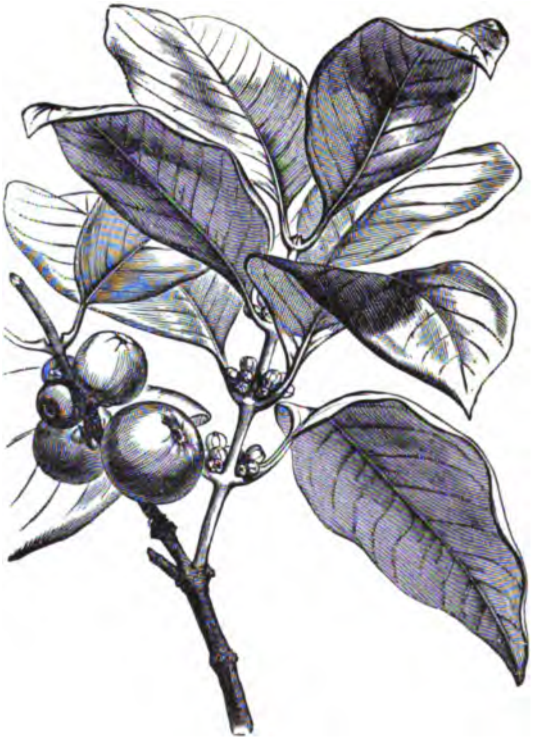
Commercial.—Gamboge as it first comes from the tree is a yellow, milky juice, which is secreted in ducts of the middle bark and to a less extent in the pith, alburnum, leaves, flowers, and fruit. It is collected by breaking off leaves and twigs of the tree, or by incisions through the bark, from which injured points the juice exudes in drops; it is caught on leaves or in cocoanut shells or in bamboo joints, where it is allowed to harden during summer. Each tree yields biennially 3 bamboo joints 50 Cm. (20′) long, 4 Cm. (1½′) thick. Trees should be tapped only in alternate years.

We have several commercial varieties depending upon their shape, which enter market via Canton, Calcutta, Singapore, Bangkok, Saigon, etc.

1. *Pipe* or *Roll.*—This is the best, and results when the juice is caught in hollow bamboo joints.

2. *Cake* or *Lump.*—This is in masses of 2–3 lbs. (.7–1 Kg.) usually somewhat mixed with sticks, flour, etc., and results from the juice being caught in leaves and various vessels, during which more or less exposure occurs; it is less uniform, less brittle, fracture dull or brownish, non-conchoidal, sometimes called *coarse gamboge.* *Tests:* 1. When pure the gum-resin is completely dissolved by successive treatments of ether or alcohol, and then water. 2. Rubbed down with hot water yields yellow emulsion, when boiled with water, cooled, and iodine T. S. added should not get green coloration (abs., starch, flour, etc.).

FIG. 254.



Garcinia Hanburii.

CONSTITUENTS.—Gum 16–26 p. c., Resin (cambogic acid) 66–80 p. c., moisture 4 p. c., wax 4 p. c., ash 1–3 p. c.

Gum.—Soluble in cold water like gum arabic (*arabin*) but not identical with it, as it is not precipitated by lead acetate, ferric chloride, sodium silicate or sodium biborate.

Resin.—Soluble in ether and alcohol, forming golden-yellow tinctures, also in alkaline solutions with red color, from which it is precipitated unaltered by acids. It has acid characteristics, hence sometimes called cambogic acid, and upon it the coloring matter and medicinal properties depend.

PREPARATIONS.—1. *Pilulæ Catharticæ Compositæ*, gr. ¼ (.016 Gm.). Dose, 1–3 pills.

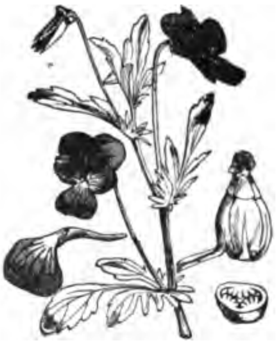
PROPERTIES.—Drastic, hydragogue cathartic; in small repeated doses diuretic. Usually produces much griping, nausea and vomiting when taken in full doses, so that it is generally combined with other cathartics, as calomel, jalap, potassium bitartrate or carbonate, etc.; it greatly irritates the alimentary canal, especially the small intestine when taken in excess, and 60 grains (4 Gm.) have occasioned death; it augments intestinal glands' secretion, but not of bile, and mostly passes in the fæces, but some is absorbed causing yellow urine.

USES.—Liver trouble from malaria; kidney complications, vermifuge, tænifuge, dropsy; very uncertain in veterinary practice. Mostly used as pigment in water-color painting. The powder when rubbed up with water shows strongly the "Brownian movement" under the microscope.

Allied Plants:

1. Several guttiferous plants of Southern India, not restricted, however, to the Cambodia province, as is the official, are almost identical with this latter and yield a similar juice: *Garcinia More'lla* (staminate flowers sessile). Ceylon, S. India. *G. travanco'rica.* Travancore. *G. picto'ria.* Madras peninsula, etc. *G. Mangosta'na, Mango Fruit.* India; astringent. *G. (in'dica) purpu'rea.* India. The seeds of this are exposed to the sun and then boiled in water, when 10–20 p. c. of a fixed oil (kokum-butter) is obtained.

FIG. 255.



Viola tricolor.

2. *Cane'lla Wintera'na (a'lba), White Cinnamon.*—Canellaceæ. The bark official, 1820–1880; W. Indies. Tree 9–15 M. (30–50°) high, recognized by whitish bark; leaves thick; flowers white, aromatic; fruit berries 12 Mm. (½') long, blackish. Bark in quills 15–60 Cm. (6–24') long, 3 Mm. (⅛') thick, deprived of gray corky layer, orange-red, with scars, inside striate with resin-cells, cinnamon-odor; taste bitter, biting. Contains volatile oil (having eugenol) 1 p. c., resin 8 p. c., bitter principle. Used in gastric debility, menorrhagia, amenorrhœa, as stimulant, tonic, condiment. Dose, gr. 5–30 (.3–2 Gm.). *Pulvis Aloes et Cannellæ, Hiera-picra,* official, 1820–1880.

3. *Vi'ola tri'color, Pansy.*—Violaceæ. The flowering herb official, 1880–1890; Europe, N. America, cultivated. Plant 10–30 Cm. (4–12') high, angular; leaves roundish, cordate; flowers variegated (yellow, whitish, blue, purplish); taste bitter; contains salicylic acid 0.1 p. c., bitter principle, resin. Used in skin diseases, scrofula, syphilis, bronchitis, nephritis, as alterative, expectorant; large doses

emetic, cathartic. Dose, gr. 15–60 (1–4 Gm.); in decoction, infusion, extract. *Vi'ola peda'ta*, *Bird's-foot* or *Blue Violet*. The herb and rhizome official, 1820–1880, Europe, N. America. Plant acaulescent; leaves 3–5-divided; flowers bluish; rhizome 25 Mm. (1') long, 18 Mm. (¾') thick, bitter, acrid. Used as the preceding.

4. *Tu'rnera diffu'sa* (*microphy'lla*) var. *aphrodisi'aca*, *Damiana*.—Turneraceæ. W. Mexico, Lower California, Texas. Leaves alternate, 10–25 Mm. (⅖–1') long, wedge-shaped base, 6–12-toothed, obovate, light-green, with whitish hairs, aromatic, mint-like taste. Contains volatile oil 1 p. c. (amber-colored, aromatic odor, warm camphoraceous taste), two resins, tannin. Aphrodisiac, tonic, stimulant, laxative. Dose, ʒss–2 (2–8 Gm.), fluid extract.

5. *Lopho'phora* (*Anhalo'nium*) *Lewi'nii*, *Mescale*.—Cactaceæ. Mexico. This small plant yields the mescale buttons, which are used by the Rio Grande Indians to produce intoxication during religious ceremonies, also the alkaloid pellotine (pellotinum), $C_{13}H_{21}NO_3$. This latter is unirritating, consequently can be well employed hypodermically as a hypnotic; resembles somewhat cannabis indica. Slightly slows the pulse, produces mental and bodily weariness, sleep without untoward symptoms; excessive quantities produce spasms resembling strychnine poisoning. Hysteria, insomnia, angina pectoris, asthmatic dyspnœa, hypochondriasis. Dose, (pellotine) gr. ½–1 (.03–.06 Gm.).

6. *Ca'ctus* (*Ce'reus*) *grandiflo'rus*, *Night-blooming Cereus*.—Mexico, W. Indies; cultivated. The plant has a fleshy, green, branching stem which is used in medicine; stem 5–6-angled, angles 5–6-spined, flowers white, sessile, large, fragrant, petals and stamens numerous, fruit white berry, size of egg, acrid taste; contains cactine. Cardiac stimulant, vermifuge, emetic, cathartic. Cardiac palpitation and weakness, heart failure from valvular disease, angina pectoris, aortic regurgitation; better than digitalis in some cases; non-cumulative. Dose, gr. 5–15 (.3–1 Gm.), in tincture or fluid extract.

61. THYMELÆACEÆ. Mezereon Family.

Thim-e-le-a'se-e. L. *Thymelæ-a* + aceæ, Gr. *θυμελαία*, a plant, fr. *θύμος*, courage (thyme), + *ἐλαία*, olive tree (oil), referring to the reviving odor; or *θύω*, to perfume, being used in temples as incense. Trees, shrubs, rarely herbs. Distinguished by toughness and acridity of bark, due to bast-fibres. Leaves entire; flowers perfect; calyx regular, simple colored, 4–5-lobed, inferior; stamens perigynous, twice the calyx lobes; ovary 1-celled, superior; ovule 1; fruit nut or drupe; tropics; narcotic, poisonous.

THYMELÆACEÆ.

Genus: 1. **Daphne.**

MEZEREUM. MEZEREUM (MEZEREON).

Daphne Mezereum, *Linné,* and other species. } The bark.

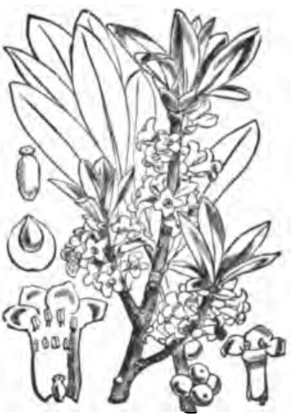
Habitat. Europe, mountainous regions (Siberia, spontaneous in Canada, New England. Cultivated for medicine and ornament).

Syn. Spurge Laurel (Olive), Spurge Flax, Lady Laurel, Wild Pepper. Br. Mezerei Cortex, Cortex (Thymeleæ) Coccognidii. Fr. Écorce de Mézéréon-, de Garou-, de Lauréole, de Thymélée, Boisgentil. Ger. Seidelbast, Kellerhals (rinde).

Daph′ne. L. fr. Gr. *δάφνη*, the laurel or bay tree, into which a nymph, beloved of Apollo, was metamorphosed, lit. fr. *δαίω*, to burn, + *φωνή*, a sound; *i. e.*, it crackles when burning.

Me-ze′re-um. L. Medieval name fr. Pers. *mazariyum*, which was then applied to species of *Daphne*.

FIG. 256.



Daphne Mezereum.

PLANT.—Small, slender, straggling shrub, .3–1.3 M. (1–4°) high; stem branching, smooth, but young branches tomentose; leaves 5–7.5 Cm. (2–3′) long, lanceolate, blunt, entire, smooth, dark-green; flowers Feb.–April, in small clusters, sessile, rose-red color, fragrant, tubular, 18 Mm. ($\frac{3}{4}$′) wide; fruit July, ovate, 9 Cm. ($\frac{3}{8}$′) long, sessile, bright-red, succulent. BARK, in long, thin bands, .6–1.3 M. (2–4°) long, 12 Mm. ($\frac{1}{2}$′) wide, 1 Mm. ($\frac{1}{24}$′) thick, folded or rolled into disks, yellowish-brown, transverse scars and minute, blackish dots. Underneath the thin cork is a parenchyma layer of light-greenish color, inner surface whitish, silky, bast in transverse layers, tough, fibrous, striated; inodorous; taste very acrid. *Solvents:* boiling water; alcohol. Dose, gr. 1–10 (.06–.6 Gm.).

Commercial.—The U. S. Pharmacopœia recognizes several other species of *Daphne* besides *D. Mezereum.* These are chiefly *D. Laure′ola, Spurge Laurel;* and *D. Gni′dium, Spurge Flax.* The former has yellowish-green flowers, purplish-black fruit, 12 Mm. ($\frac{1}{2}$′) long; the latter has whitish flowers, fruit 3 Mm. ($\frac{1}{8}$′) long, scarlet. All of these plants bear a striking general appearance in the size of their glossy, shining leaves, flowers, etc., to the extent of suggesting a relationship. The bark should be taken from stem Nov.–Feb., dried, then made into rolls or bundles. Mostly obtained from Germany. In powdering muzzle the nostrils, or occasionally add a little water to prevent inhaling poisonous dust.

CONSTITUENTS.—Acrid resin, Acrid volatile oil, Daphnin; by dry distillation yields umbelliferon.

Acrid Resin (Mezerein).—Obtained by boiling the bark with alcohol, distilling and treating residue with water, thus leaving resin; it is blackish-green, hard, brittle, permanent, acrid taste; this is the vesicant.

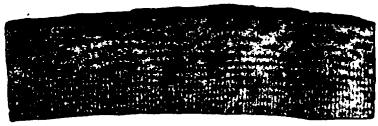
Daphnin, $C_{15}H_{16}O_9$.—Bitter glucoside; obtained by precipitating the decoction of alcoholic extract with lead subacetate, filtering, decomposing with hydrogen sulphide, evaporating filtrate, treating residue with alcohol or water, crystallize; soluble in alkalies with yellow color, insoluble in ether, blue with ferric salts, not acrid, by acids forms glucose and daphnetin; little value medicinally, as that resides in the volatile oil and its transformed resin.

PREPARATIONS.—1. *Extractum Mezerei Fluidum.* Fluid Extract of Mezereum. (Syn., Fr. Extrait liquide de Mézéréon (de Garou); Ger. Flüssiges Seidelbast-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏j–10 (.06–.6 Cc.).

Prep.: 1. *Linimentum Sinapis Compositum*, 20 p. c. (fld. extr.).

FIG. 257.



Mezereum; transverse section, magnified 15 diam.

2. *Decoctum Sarsaparillæ Compositum*, 1 p. c. Dose, ℥j–4 (30–120 Cc.).

3. *Extractum Sarsaparillæ Compositum Fluidum*, 3 p. c. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract (alcoholic). Dose, gr. 1–2 (.06–.13 Gm.). *Decoction. Ointment.*

The extract and fluid extract are mostly used in liniments.

PROPERTIES.—Similar to other drugs with volatile oils, and to sanguinaria: stimulant, diuretic, diaphoretic, alterative, sialagogue, vesicant. Large doses cause purging, vomiting, acrid poisoning, death.

USES.—Syphilis, scrofula, rheumatism, skin diseases. Externally, local irritant like cantharides, applied to indolent ulcers to make them again active, also to maintain discharges from setons, fly blisters, etc.

Poisoning: Evacuate stomach with warm albuminous or mucilaginous drinks, follow with milk, fatty oils, and opium for depression.

Incompatibles: Tannin and free acids precipitate the glucoside, and water the resin.

Synergists: Alteratives except colchicum.

Allied Products:

1. *Leaves of D. salicifo'lia.*—Mexico. Used natively as a vesicant.
2. *Fruits* of the various species contain 31 p. c. of fixed oil.

62. LYTHRACEÆ (PUNICACEÆ). Loosestrife Family.

Lith-ra'se-e. L. *Lithr-um* + aceæ, fr. Gr. λύθρον, gore; *i. e.*, from its purple flowers. Herbs, shrubs, often 4-sided; distinguished by containing astringent principle, coloring agent. Leaves exstipulate; calyx tubular, persistent, bearing deciduous petals and stamens; lobes valvate; petals 4–7, wrinkled; stamens 4–14, perigynous, inserted below petals; ovary 1–2–6-celled, superior; ovules many; style 1; stigma rarely 2-lobed; fruit capsule, membranous, dehiscent, surrounded by non-adherent calyx-tube; seeds many, exalbuminous; temperate climates, tropics; astringent, dye.

Genus: 1. **Punica.**

GRANATUM. POMEGRANATE.

Punica Granatum, *Linné.* } The bark of the stem and root.

Habitat. S. W. Asia, India, Persia, Arabia, China, Japan, E. (and W.) Indies. Naturalized in subtropics, S. United States, etc., cultivated for fruit, and as an ornament (flowers).

Syn. Grenadier, Punic—Puncie or Carthaginian Apple. Br. Granati Radicis Cortex; Fr. Écorce de (Granade) Balaustier. Ger. Cortex Granati, Granatrinde.

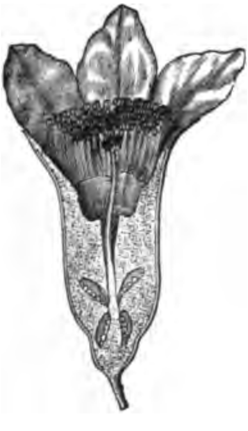
Pu′ni-ca. L. *punicus*, of or belonging to Carthage, near which city it is said to have been first found, or fr. *puniceus*, scarlet; *i. e.*, the color of its flowers.

Gra-na′tum. L. *granatus*, having many grains or seeds, fr. *granum; i. e.*, the many-seeded fruit.

Pome′gran-ate. L. *pomum*, a fruit, + *granatus*, grained.

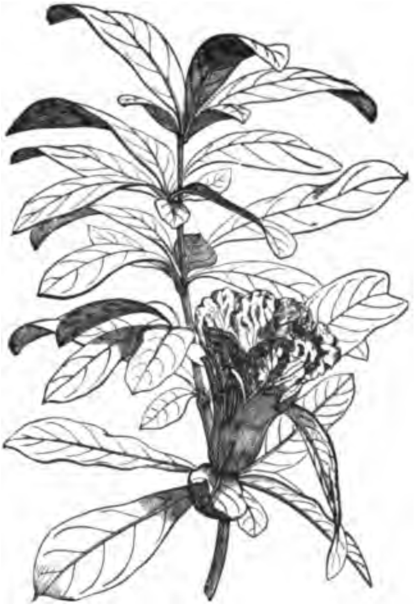
PLANT.—Shrub or small tree, 4.5 M. (15°) high, branches angular, with spiny ends; young shoots and buds red; leaves 2.5–5 Cm. (1–2′) long, shining, lanceolate, entire, half evergreen; flowers June–Sept., large; calyx shining, scarlet, tubular, 3 Cm. (1¼′) long; corolla crimson, 5–7 petals; fruit (balausta), 5–10 Cm. (2–4′) broad, resembles an orange, quince, or tomato, 5–8-angled over the dissepiments, short-necked at top. Internally, below the median line, divided by a

FIG. 258.



Punica Granatum, flower.

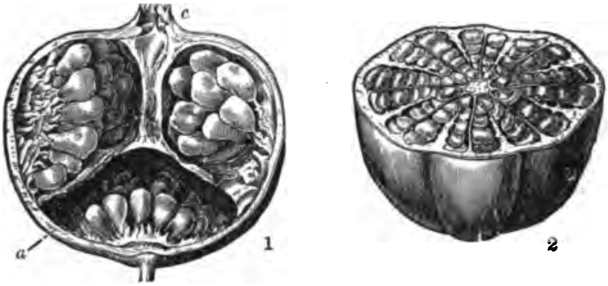
FIG. 259.



Punica Granatum, flowering branch.

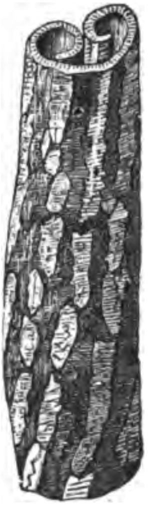
diaphragm into two stories—upper with 5–8 irregular cells, lower with one or more vertical partitions; seeds angular, 12 Mm. ($\frac{1}{2}$′) long, so numerous that they, with the thin surrounding edible pulp, fill entire fruit. BARK, in thin quills or fragments, 5–10 Cm. (2–4′) long, 2 Mm. ($\frac{1}{12}$′) thick, yellowish-gray, warty or longitudinally ridged; stem-bark often partly covered with blackish lichens, thicker pieces of root-bark more or less scaly, inner surface smooth, finely striate, grayish-yellow, fracture short, granular, greenish-yellow, indistinctly radiate; inodorous; taste astringent, slightly bitter, most efficient when fresh, chiefly imported in dry state from France and Italy, although we use much of that grown in our own country. Besides this bark the flowers, fruit, rind, and acidulous seed-coating are sometimes used domestically. *Solvents:* boiling water; diluted alcohol. Dose, ʒss–2 (2–8 Gm.).

FIG. 260.



Punica Granatum; 1, longitudinal cross-section; 2, transverse cross-section; *a*, inner rind and ovules; *c*, the remaining calyx.

FIG. 261.



Granati cortex, bark of the root.

SUBSTITUTIONS.—1. *Bu'xus sempe'rvirens, Boxwood Bark.* 2. *Be'rberis vulga'ris, Barberry Bark.* Neither has tannin, hence infusions do not precipitate blue-black with iron like pomegranate bark; they are also bitter. 3. *Granati Fructus Cortex.* This contains tannin 19–28 p. c., extractive 21 p. c., gum 34 p. c., and has same effect as the bark.

CONSTITUENTS. — Punico-tannic (gallo-tannic) acid, $C_{20}H_{16}O_{13}$, 20 p. c., Pelletierine (punicine) ½–1½ p. c., isopelletierine, methylpelletierine, pseudopelletierine, mannit, sugar, gum, pectin, ash 15 p. c. The stem-bark has of alkaloids 0.35–0.61 p. c., while root-bark contains 1.01–1.32 p. c.

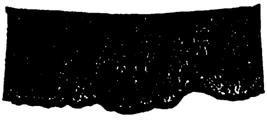
Pelletierine, $C_8H_{15}NO$ (in honor of Pelletier).—This is obtained by mixing bark with milk of lime, displacing with water, exhausting percolate with chloroform. It is regarded by Tanret, its discoverer, to be the anthelmintic constituent, and is a colorless, oily, aromatic alkaloid, resinifying on exposure, soluble in water, alcohol, forms crystalline salts (nitrate, sulphate, tannate, etc.)—considered to be a mixture of several alkaloids. Dose, Pelletierine tannate, gr. 5–10 (.3–.6 Gm.).

PREPARATIONS.—(Unoff.) *Decoction*, 12 p. c. Dose, ℥j–5 (30–150 Cc.). *Rind*. Dose, gr. 15–30 (1–2 Gm.).

PROPERTIES.—Anthelmintic, tænifuge, astringent.

USES.—The ancients knew its value as a vermifuge (Celsus, Dioscorides, Pliny). In Hindustan the Mohammedan physicians used it in tænia, one of whom in 1804 made this, their secret, public. The French physicians prefer the wild-grown plant. Externally and internally astringent; large doses occasion vomiting, purging, cramps, numbness in the legs, giddiness, dim vision, increased urine. The rind is also astringent in diarrhœa, leucorrhœa, hemorrhage, cancerous, and other ulcers of uterus and rectum; intermittent fever. For tape-worm take decoction made by boiling bark ℥ij (60 Gm.) + water Ojss (.7 L.) down to Oj (.5 L.); give this in three broken doses at hour intervals in the morning on empty stomach. It is well, a couple of hours after administration, to follow with castor-oil ℥j (30 Cc.) or compound tincture of jalap ℥j (30 Cc.). The worm should be passed sitting in a tepid sitz-bath, thus preventing the expelled portion tearing from the head by its weight. It passes usually in a knotted mass. Pomegranate can also be used for tanning, dyeing; the fruit as a refreshing, cooling article of food.

FIG. 262.



Granati cortex; transverse section, magnified 10 diam.

63. MYRTACEÆ. Myrtle Family.

Mer-ta'se-e. L. *Myrt-us* + aceae, Gr. *μύρτος*, myrtle, fr. *μύρον*, perfume; *i. e.*, characteristic of some species. Trees, shrubs; distinguished by aromatic, pungent properties (vol. oil); stamens 8–10 +; leaves exstipulate, opposite, dotted with marginal vein; calyx and petals 4–5; ovary inferior, 1–6-celled; fruit dry or succulent; seeds exalbuminous; temperate climates, tropics; aromatic, stimulant, carminative (vol. oil), diaphoretic, antispasmodic, astringent, spices, perfumery, edible fruit; timber.

Genera: 1. **Cajuputi (Melaleuca)**. 2. **Eugenia**. 3. **Pimenta (Myrcia)**. 4. **Eucalyptus**.

CAJUPUTUM. CAJUPUT.

Oleum Cajuputi. Oil of Cajuput, *official.*

Cajuputi viridiflora, (*Gærtner*) *Lyons.* } A volatile oil, distilled from the
(**Melaleuca Leucadendron,** *Linné.*) } leaves.

Habitat. E. India Islands (Celebes, Bouro, Amboyna, Moluccas, Philippines, Cochin-China).

Syn. Kayu-puti, White-wood. Fr. Essence or Huile de Cajeput. Ger. Cajeputöl.

Caj-u-pu'ti. L. fr. Malay, *kayu*, tree, + *putih*, white; *i. e.*, the appearance of the branches.

Vir-id-i-flo′ra. L. *viridis*, green, greenish, + *flos*, *floris*, flower; *i. e.*, flowers more or less greenish.

Mel-a-leu′ca. L. fr. Gr. μέλας, black, + λευκός, white; *i. e.*, bark of the trunk is blackish, that of the branches is whitish.

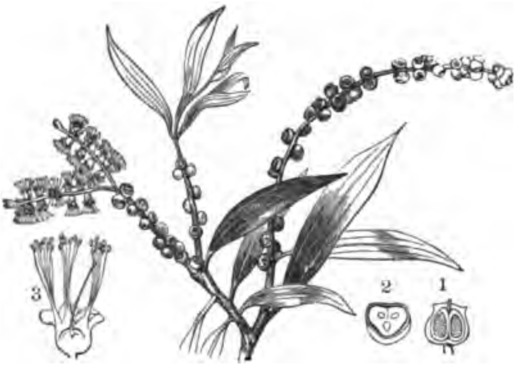
Leu-ca-den′dron. L. fr. Gr. λευκός, white, + δένδρον, a tree.

PLANT.—Small tree; bark gray, brittle, splitting into thin layers; leaves 5–10 Cm. (2–4′) long, blade twisted, lanceolate; flowers 5–7.5 Cm. (2–3′) long, greenish to whitish, silky, pubescent, spikes; fruit woody, hard, sessile, dehiscing in 3 valves.

CONSTITUENTS.—Volatile oil, mucilage, pectin.

Oleum Cajuputi, Oil of Cajuput.—A light, thin, bluish-green (due to copper usually) liquid, yellowish after rectification, odor peculiar, agreeable, camphoraceous; taste aromatic, bitter; sp. gr. 0.925, does not congeal at −25° C. (−13° F.). Contains chiefly cajuputol (cineol, eucalyptol), $C_{10}H_{18}O$, 67 p. c., also terpineol, $C_{10}H_{17}OH$, and several terpenes—$C_{10}H_{16}$ (cajuputene) and $C_{15}H_{24}$, also acetic, butyric, and valerianic ethers of terpineol. *Tests:* 1. Agitate oil with hot diluted hydrochloric acid, add potassium ferrocyanide, get reddish precipitate if copper present, otherwise it remains nearly colorless. 2. It dissolves iodine without violent reaction, is turned yellowish by ammonia, and purplish-brown by sulphuric acid. It is mostly imported from Celebes, Bauro (islands) but some from Singapore, Java, Manila in glass bottles or copper cans. It is soluble in an equal volume of alcohol, and should be kept cool in well-stoppered bottles. Dose, ♏ij–10 (.13–.6 Cc.) in emulsion, pill, on sugar; externally in liniments.

FIG. 263.



Cajuputi viridiflora—small branches with leaves, buds, and flowers; 1, vertical section of fruit; 2, transverse section of ovary; 3, vertical section of flower.

ADULTERATIONS.—Copper from its shipping cans, and owing to its value many cheaper oils are mixed with it, as rosemary, turpentine, camphor, also these sometimes colored with resin of milfoil, all of which render action with iodine more violent.

PROPERTIES.—Same as oil of cloves; carminative, stimulant, diaphoretic, vermifuge, parasiticide, rubefacient, counter-irritant.

USES.—Rheumatism, myalgia, spasmodic affections of the stomach and bowels, catarrh of bladder, low fevers, gout, colic, cholera morbus, dysmenorrhœa, laryngitis, bronchitis, toothache, chilblains.

CARYOPHYLLUS. CLOVES.

Eugenia aromatica, (*Linné*) *Kuntze.* } The unexpanded flowers.

Habitat. Molucca (Spice or Clove) Islands, five in number, N. E. of Celebes, now destroyed there but cultivated in Indian Ocean Islands, Amboyna group, Sumatra, Malacca, Penang, etc., S. America, Brazil, Guiana, Cayenne, Africa, Zanzibar, West Indies.

Syn. Mother Cloves, Caryophylli Aromatici. Fr. Girofle, Gérofle, Clous (aromatiques) de Girofles. Ger. Gewürznelken, Nägelein.

Eu-ge′ni-a. L. fr. Gr. *εὐ*, well, + *γενής*, born, = noble birth; *i. e.*, in honor of Prince Eugene of Savoy, a great patron of Botany (died 1736).

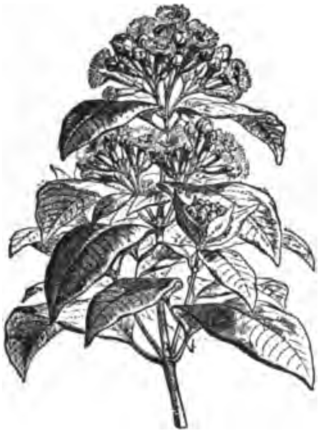
Ar-o-mat′i-ca. L. *aromaticus*, fragrant; *i. e.*, its aromatic, fragrant odor.

Car-y-o-phyl′lus. L. fr. Gr. *κάρυον*, a nut, + *φύλλον*, a leaf; *i. e.*, referring to the appearance of flower buds.

Clove. L. *clavus*, a nail; *i. e.*, the resemblance of its dried flowers.

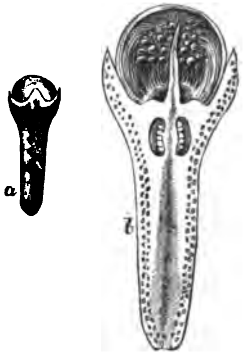
PLANT.—Handsome evergreen tree, 9–12 M. (30–40°) high, much branched, forming a pyramidal crown; bark yellowish; leaves 10 Cm. (4′) long, 5 Cm. (2′) wide, entire, smooth, glandular, parallel veins to midrib, petiolate; flowers 15–20, rose-colored, cymes; fruit berry-like. UNEXPANDED FLOWERS (cloves), about 18 Mm. ($\frac{3}{4}$′) long, dark-brown, consisting of a subcylindrical, solid and glandular calyx-tube, tapering below, terminated by four teeth clasping the four lighter petals, which in turn make up the head enclosing the ovary, stamens, etc.; contain many oil-glands under the epidermis, and when scratched oil exudes; odor aromatic; taste pungent, spicy. *Solvents:* alcohol extracts the virtues (volatile oil, resin); water takes up the odor (part of the volatile oil), but none of the pungent taste. Dose, gr. 5–15 (.3–1 Gm.).

FIG. 264.



Eugenia aromatica.

FIG. 265.



Caryophyllus; *a*, natural size; *b*, longitudinal section magnified.

Commercial.—Trees begin yielding when six years old, reaching their perfection at twelve, thence declining until, at twenty, they perish.

At first cloves (flowers or buds) are white, then green, then bright-red, and at this last stage they are collected by hand-picking on ladders, platforms, or by beating trees with bamboos, and catching falling buds upon outspread cloths; they are now dried by sun or slowly by fire. Each tree yields 5 lbs. (2.3 Kg.), which bring on the spot about 10 cents per pound (.5 Kg.). Cloves were unknown to the ancients, being brought to Europe by Arabians and Venetians; the Portuguese and Dutch long monopolized the trade. Most of these now come direct from Zanzibar, some from Pemba, others via Bombay, although much of our supply is from W. Indies, Cayenne, Guiana, etc. We have several varieties: 1. *Molucca, Amboyna;* these are the thicker, heavier, darker, most oily and aromatic. In the Moluccas have two annual harvests June and Dec. 2. *Sumatra, Bencoolen;* these are by some considered of equal high grade as the Molucca. 3. *S. American;* these are usually not as fine as, but fresher than either of the preceding, yielding in volatile oil 10–15 p. c. Cloves that are light, soft, wrinkled, pale-colored, of feeble taste and smell, are inferior and should not be used direct or in obtaining oil.

ADULTERATIONS.—1. *Clove-stalks,* 2 Mm. ($\frac{1}{12}'$) thick, brown; contain volatile oil 4–5 p. c. (imported for this constituent). 2. *Mother Cloves, Clove Fruit.* Collected just before ripe, 2.5 Cm. (1′) long, resemble cloves, but are thicker, lighter, weaker, with 4-lobed calyx, each cell 1–2-seeded; contain volatile oil 2–4 p. c. 3. *Exhausted cloves*—such as have undergone partial or complete exhaustion and distillation, All these substances are more frequently ground finely and mixed with powdered cloves. It is difficult to detect such additions except in the weakness of the preparations, which give unsatisfactory results in use. The volatile oil is often mixed with fixed oils, carbolic acid, oil of turpentine, oil of pimenta, and copaiba.

CONSTITUENTS.—Volatile oil 18 p. c., tannin (gallo-tannic acid) 10–13 p. c., gum 13 p. c., resin (tasteless) 6 p. c., caryophyllin; eugenol, $C_{10}H_{12}O_2$, cellulose 28 p. c., water 18 p. c.

Oleum Caryophylli. Oil of Cloves, *official.*—(Syn., Fr. Essence de Girofles; Ger. Nelkenöl.) This volatile oil is distilled from cloves with water or steam, and usually sodium chloride (3 p. c.) is added to raise the ebullition point, possibly to 109.5° C. (229° F.). It is a pale-yellow, thin liquid, darker, thicker by age; characteristic odor; pungent, spicy taste, sp. gr. 1.065, soluble in equal volume alcohol, glacial acetic acid, gives yellow mass with solution of potassa or ammonia. It consists of light portion—sesquiterpene termed caryophyllene, $C_{15}H_{24}$ (polymeric with terpene, $C_{10}H_{16}$), sp. gr. 0.918, and a heavy portion, eugenol, $C_{10}H_{12}O_2$, 80–90 p. c., also its acetic and acetyl salicylic acid ester, furfurol, and methyl-amylketone (minute quantity, to which characteristic aromatic odor is due). *Tests:* 1. 1 Cc. oil + 2 Cc. of a mixture containing 2 volumes of alcohol and 1 of water, when shaken should yield clear, perfect solution (abs. petroleum, most fatty oils, oil of turpentine, and similar oils). 2. 1 Cc. oil + 20 Cc. hot water, shaken, cooled, filtered, the clear filtrate with ferric chloride

T. S. should give transient, grayish-green, but not blue or violet color (abs. carbolic acid). The oil should be kept cool, dark, in well-stoppered bottles. Dose, ♏j–5 (.06–.3 Cc.).

Eugenol (*eugenin, caryophyllic* or *eugenic acid, para-oxy-meta-methoxyallyl benzol*).—The value of the oil depends upon this alone, which may be obtained by distilling cloves (or oil) with excess of potassa, when light oil of cloves (caryophyllene) passes over, while heavy potassium eugenol remains behind; this latter is decomposed with sulphuric acid, and the separated oil, eugenol, rectified. It is colorless, oily liquid, clove odor, sp. gr. 1.076, red with sulphuric acid, blue with ferric chloride, with bases yields crystallizable salts, fused with potassa becomes decomposed into protocatechuic and acetic acids, by potassium permanganate oxidized to vanillic acid, boils at 254° C. (489° F.), should form clear solution with 1–2 p. c. solution of potassa.

Caryophyllin, $C_{10}H_{16}O$.—Obtained by treating ethereal extract of cloves with water, the resulting precipitate is filtered and treated with ammonia to purify; occurs in tasteless, inodorous silky needles, colored red with sulphuric acid, and yields crystals of caryophyllinic acid, $C_{20}H_{32}O_6$, by oxidation with nitric acid.

PREPARATIONS.—1. *Tinctura Lavandulæ Composita,* ½ p. c. **Dose,** ʒss–2 (2–8 Cc.).

2. *Tinctura Rhei Aromatica,* 4 p. c. Dose, ʒss–4 (2–15 Cc.).

3. *Vinum Opii,* 1 p. c. Dose, ♏v–20 (.3–1.3 Cc.).

Unoff. Preps.: Tincture, 25 p. c. (Fr., alcoholic). Dose, ʒss–1 (2–4 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Stimulant, stomachic, carminative, antiemetic, aromatic, antispasmodic, rubefacient, germicide, antiseptic. Increases circulation, temperature, digestion, nutrition; excreted by kidneys, skin, liver, bronchial mucous membrane, stimulating and disinfecting these routes.

USES.—Nausea, vomiting, flatulence, colic, indigestion, condiment, corrective; externally in rheumatism, neuralgia, toothache (oil + oil of peppermint + chloral hydrate), in liniments, etc.

Allied Plant:

1. *E. Jambola'na, Jambul, Java Plum.*—E. Indies. Large tree producing edible fruit; all parts astringent, but seeds and bark also arrests formation of sugar in diabetes; capsules, fluid extract. Dose, gr. 5–10 (.3–.6 Gm.).

PIMENTA. PIMENTA (ALLSPICE).

Pimenta Pimenta, (*Linné*) *Lyons.* }
(P. officinalis, *Lindley.*) } The nearly ripe fruit.

Habitat. C. and S. America, W. Indies, Jamaica, Venezuela. Cultivated.

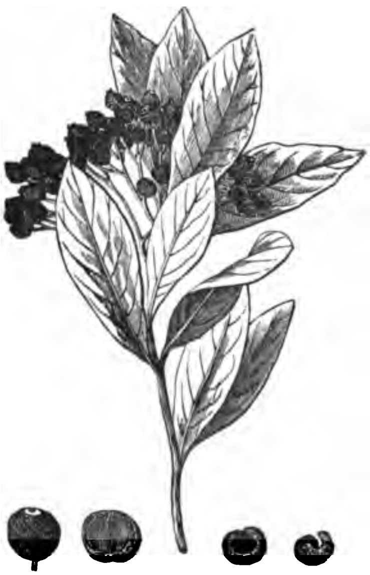
Syn. Pimento or Clove (Jamaica) Pepper, Semen Amomi, Piper Jamaicense. **Fr.** Piment de la Jamaique, Toute épice. Ger. Nelkenpfeffer, Englisches Gewürz, Neugewürz.

Pi-men'ta. L. fr. Sp. *pimienta,* pepper; *i. e.,* first European name for *Allspice;* L. *pigmentum,* spice.

Of-fi-ci-na′lis. L. see etymology of (*Asagræa*) *officinalis*, page 95. *All′spice* = *all* + *spice*; *i. e.*, supposed to combine cinnamon, nutmeg, and clove odor—at one time all the important spices.

PLANT.—Handsome evergreen tree 9–12 M. (30–40°) high, slender trunk, bark smooth, gray; young branches quadrangular; leaves 10–15 Cm. (4–6′) long, bright-green, entire, oval-oblong, obtuse, pellucid-punctate beneath, midrib prominent; flowers small, white, racemes. FRUIT, 5 Mm. ($\frac{1}{5}$′) thick, nearly globular, crowned with short, 4-parted calyx or its remnants, and short style; brownish, granular, glandular, 2-celled, each 1-seeded; seed brown, plano-convex, roundish, reniform; odor and taste pungently aromatic, clove-like; pericarp and embryo contain oil-cells, the embryo also starch grains. *Solvents:* alcohol extracts the virtues; water absorbs the flavor, and if hot, some constituents. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 266.



Pimenta Pimenta (officinalis).

Commercial. — When fruit full grown, but still green, the small twigs, bearing these arranged in bunches, are broken from trees, exposed to sun several days until dried; they are then separated from stalks and packed in bags or casks for market. If fruit be allowed to fully ripen before gathering, its aromatic warmth is lost and the taste of juniper berries acquired; fruit is occasionally colored with ferric oxide.

CONSTITUENTS.—Volatile oil 3–4 p. c., resin, fixed oil 6–8 p. c., tannin, sugar, gum, ash 4 p. c.

Oleum Pimentæ. Oil of Pimenta, *official.* — (Syn., Oil of Allspice; Fr. Essence de Piment de la Jamaïque; Ger. Pimentöl, Nelkenpfefferöl.)

This volatile oil is obtained by distilling with water or steam; it comes over in two fractions, one light, the other heavy, but both mixed together. It is a pale-yellow liquid, strong, aromatic, clove-like odor; pungent, spicy taste, darkens and thickens by age, sp. gr. 1.050, forms clear solution with equal volume alcohol, glacial acetic acid, or carbon disulphide; forms semi-solid mass with equal volume of soda solution. Contains sesquiterpene, $C_{15}H_{24}$, and eugenol, $C_{10}H_{12}O_2$, 61 p. c. *Tests:* 1. With sulphuric acid red, then purple. 2. Shake with hot water, cool, filter, + 1 drop ferric chloride T. S. should give grayish-green, not blue or violet color (abs. carbolic acid). Should be kept cool, dark, in well-stoppered bottles. Dose, 5 ♏j– (.06–.3 Cc.).

Preparations.—I. Fruit: (Unoff.) *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

II. Oil: 1. *Spiritus Myrciæ*, $\frac{1}{20}$ p. c.; use externally.

Properties.—Similar to cloves; stomachic, stimulant, carminative, condiment, improves digestion, increases salivary secretion.

Uses.—Flatulence, nausea, intestinal colic, corrective to griping purgatives and nauseous tasted medicines. May combine with Burgundy pitch or lead plaster for rheumatism, neuralgia, chilblains, etc., causing local warmth, smarting, redness.

MYRCIA. BAYBERRY.

Oleum Myrciæ. Oil of Myrcia (Oil of Bay), *official.*

Pimenta acris, (*Swartz*) *Wight.*
(Myrcia acris, *De Candolle.*) } A volatile oil distilled from the leaves.

Habitat. W. Indies, Jamaica, Trinidad, Venezuela. Cultivated in India.

Syn. Bay (Rum) Tree or Leaf, Wild Clove, Black or Wild Cinnamon, Jamaica Bayberry. Fr. Essence de Myrcie (de Bay). Ger. Myrcienöl, Bayöl.

Myr′ci-a. L. a surname of Venus; *i. e.*, from its beautiful plants.

A′cris. L. *acer*, sharp, pungent, fr. Gr. ἀκίς; *i. e.*, the odor of the leaves.

Plant.—Tree is beautiful, fragrant, with polished foliage, 9–12 M. (30–40°) high; branches square; bark grayish-brown; leaves 5–9 Cm. (2–3½′) long, ovate, obtuse, coriaceous, entire, strongly veined, pellucid-punctate, shining, exhaling aromatic odor when bruised, similar to cloves; flowers small, white with red tinge, dotted with glands; fruit globular berry, size of a pea, smooth, blackish when ripe, 2-celled, resembling allspice.

Constituents.—Volatile oil, tannin.

Oleum Myrciæ. Oil of Myrcia.—This is obtained by distillation with water or steam; it is an aromatic, yellowish liquid, clove-like odor, pungent spicy taste, sp. gr. 0.985, only slightly turbid with equal volume alcohol, glacial acetic acid or carbon disulphide. Contains two phenols—eugenol, $C_{10}H_{12}O_2$ (chief constituent), and chavicol, $C_9H_{10}O$, methyl-eugenol, $C_{11}H_{14}O_2$, methyl-chavicol, $C_{10}H_{12}O$, two terpenes—myrcene, $C_{10}H_{16}$ (secondary constituent), and phellandrene, $C_{10}H_{16}$, one aldehyde—citral, $C_{10}H_{16}O$. *Tests:* 1. 3 drops each of oil and sulphuric acid, corked in test-tube, gives within half an hour resinous mass; to this add 4 Cc. diluted alcohol, shake well, heat to boiling, liquid should be nearly colorless, not acquiring red, purplish-red color (dist. from oil of pimenta and cloves). 2. 1 Cc. oil + 20 Cc. hot water, the clear filtrate + 1 drop ferric chloride T. S. should give grayish-green, not a blue or violet (abs. carbolic acid). 3. Congeals with potassa or soda.

In distilling the leaves, that first coming over is light oil floating upon water, then comes an oil heavier than water; these two mixed constitute the oil of commerce. While most of the higher grades are produced natively, considerable is distilled in this country from the imported leaves.

Preparation.—1. *Spiritus Myrciæ.* Spirit of Myrcia. (Syn. Bay Rum.)

Manufacture: Oil of myrcia 8 Cc., oil of orange peel .5, oil of pimenta .5, alcohol 610, water q. s. 1,000 Cc.; use externally.

The so-called better grades of bay rum are imported from the W. Indies, where the leaves and St. Croix rum are distilled together. To these are often added, in varying proportions, fruit and other kinds of leaves. In late years, however, much bay rum of fine quality has been and is distilled in our own country.

Properties.—Astringent, tonic, stimulant, perfume.

Uses.—The oil as a perfume and an ingredient to bay rum; the spirit as a refreshing perfume in nervous headache, faintness, nervous disorders, chafing, irritated parts, hair washes, perfumery. The dried unripe fruit forms a substitute for allspice.

EUCALYPTUS. EUCALYPTUS.

Eucalyptus globulus, *Labillardière.* } The leaves, collected from older parts of the tree.

Habitat. Australia (Tasmania, Victoria. Cultivated in subtropics, Europe, N. Africa, S. United States (California, Florida, etc.), rich valleys, moist slopes of wooded hills).

Syn. Gum Wood, Fever Tree of Australia, Blue Gum-Tree, Wooly Butt, or Iron Bark Tree. Fr. Feuilles d'Eucalyptus. Ger. Eucalyptus-Blätter.

Eu-ca-lyp'tus. L. fr. Gr. εὐ, well, good, + καλυπτός, covered; *i. e.*, the calyx-limb covers the flower-bud before expansion and afterward, at anthesis falls off in the shape of a lid or cover—the outer operculum of the bud (not the inner of united petals).

Glob'u-lus. L. *globulus, globulosus*, a little ball, globular; *i. e.*, the thick button-like form of the fruit.

Plant.—Rapid-growing tree, 60–90 M. (200–300°) high, 3–6 M. (10–20°) thick (the largest being 141 M. (470°) high, 27 M. (87°) in circumference, from *E. amygdali'na*); bark ash-colored; flowers Nov.–Dec., hermaphrodite, pedunculate, whitish, buds very glaucous and consist of calyx-tube covered by conical lid (operculum) of calyx-limb and united petals; fruit capsules 18 Mm. ($\frac{3}{4}'$) wide, half-globular, 4–5-ribbed, dehiscing at apex, many-seeded. Leaves, petiolate, lanceolately scythe-shaped, 15–30 Cm. (6–12′) long, rounded below, tapering above, entire, leathery, grayish-green, glandular, feather-veined between the midrib and marginal veins; odor strongly balsamic, camphoraceous; taste pungently aromatic, cooling, bitter, astringent. *Solvents:* boiling water; diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

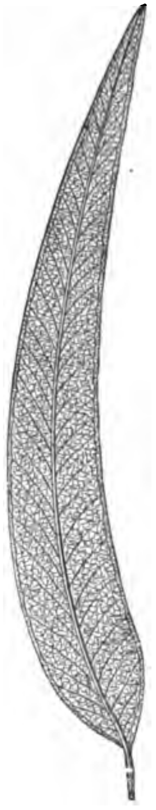
Commercial.—The blue gum-tree of Tasmania (exudes a blue gum) was discovered by Labillardière, French botanist, in 1792, and introduced into Europe, 1856. It is sensitive to cold but under favorable conditions attains the height of 15 M. (50°) in 6 years; the wood is durable, hard, resinous; there are 135 species. Leaves are picked, carefully dried, and enter trade very little broken. The aborigines knew something of its virtues, the Spaniards in 1867 used it for fever and ague, but Drs. Brunel and Ramel, 1868–1869, extolled and proved its antiperiodic properties. The Australian leaves should alone be used as they vary less in yield of oil.

CONSTITUENTS.—Volatile oil 6 p. c., tannin, cerylic alcohol, crystallizable fatty acid, 3 resins.

Oleum Eucalypti. Oil of Eucalyptus, *official.*—(Syn., Fr. Essence d'Eucalyptus; Ger. Eucalyptusöl.) This volatile oil is distilled from fresh leaves (as old leaves contain very little oil) of this and other species of *Eucalyptus.* It is a faintly yellowish liquid, of characteristic aromatic, camphoraceous odor, pungent, spicy, cooling taste, sp. gr. 0.920; soluble in alcohol, glacial acetic acid, carbon disulphide. Contains cymene, $C_{10}H_{14}$, 20 p. c., eucalyptene, $C_{10}H_{18}$, 60 p. c., terpene—dextrogyrate pinene (small amount), $C_{10}H_{16}$, and eucalyptol, $C_{10}H_{18}O$, also small amounts of valeric, butyric, and capronic aldehydes. With hydrochloric acid yields eucalypteol (eucalyptene hydrochlorate), $C_{10}H_{16}.2HCl$, in white, hygroscopic, aromatic crystals. With phosphoric oxide yields eucalyptolene, thickish liquid. *Test:* Oil 1 Cc., glacial acetic acid 2 Cc., + solution sodium nitrite 1–2 Cc. should not form a crystalline mass upon stirring (distinction from oils of eucalyptus containing phellandrene). Should be kept cool, dark, in well-stoppered bottles. Dose, ♏v–15 (.3–1 Cc.).

Eucalyptol. Eucalyptol, $C_{10}H_{18}O$, *official.*—(Syn., Cineol, Cajuputol.) This is the most valuable constituent of Eucalyptus Oil; it is a neutral substance having a definite chemical composition (which is not true of the oil), and is obtained by distilling the volatile oil (of this and other species) and placing in a freezing mixture that portion which comes over between 150–175° C. (302–347° F.) when it crystallizes in long needles. Also may get it by distilling the leaves and setting aside (as crude eucalyptol) that portion coming over between 170–178° C. (338–352° F.), which to obtain pure has to be redistilled with potassa or calcium chloride; other plants yield it as santonica, rosemary, curcuma, cajuput, mentha, salvia, laurus, canella, etc.; with phosphoric anhydride (oxide) get eucalyptene and eucalyptolene. It is a colorless liquid, characteristic odor and taste, sp. gr. 0.930, freezing at — 2° C. (28° F.). liquefying again at — 1° C. (30° F.). *Tests:* 1. Optically inactive (abs. oil of eucalyptus and other volatile oils, 2. Alcoholic solution + 1 drop ferric chloride T. S. should not give brown or violet color (abs. of phenols). Dose, ♏v–15 (.3–1 Cc.).

FIG. 267.



Eucalyptus globulus.

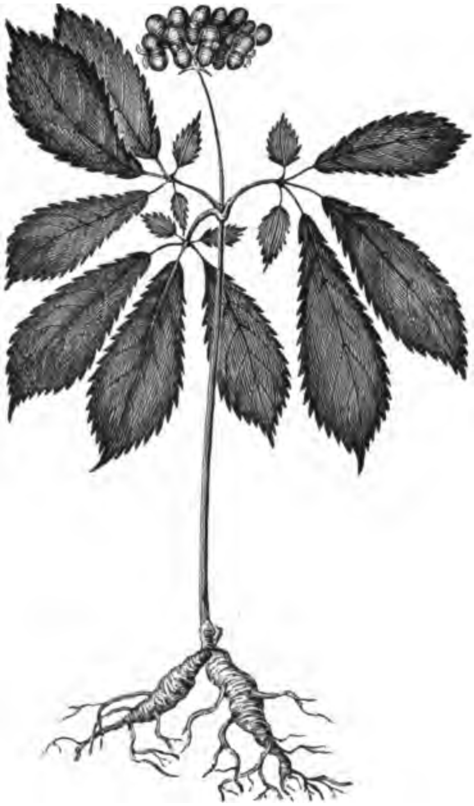
PREPARATIONS.—1. *Extractum Eucalypti Fluidum.* Fluid Extract of Eucalyptus. (Syn., Fr. Extrait liquide d'Eucalyptus; Ger. Flüssiges Eucalyptus-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Tincture, 15 p. c. Dose, ʒss–2 (2–8 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 2–10 (.13–.6 Gm.). *Water (Aqua).* Dose, ʒj–4 (4–15 Cc.).

Properties.—Antiperiodic, antipyretic, expectorant, stimulant, astringent, antiseptic, disinfectant, diaphoretic; like quinine arrests white blood-corpuscle movement; increases flow of saliva, gastric juice, heart action, appetite, digestion. Large doses produce indigestion, diarrhœa, vomiting, muscular weakness, low temperature, renal and cerebral congestion, paralyzed respiration, death. Destroys low forms of life, reduces arterial tension and enlarged spleen. It antagonizes malaria thus: 1, its dead leaves elevate moist soil; 2, being a rapid grower its leaves, roots, etc., absorb much malarial soil water and noxious germs, thus causing the surrounding country to dry up, thereby purifying the atmosphere; 3, its enormous foliage protects much soil from direct sun-rays which favor the generation of animalculæ; 4, its aseptic emanations purify the air. Owing to these conditions it is largely cultivated in malarial districts, to render them sanitative, and to reclaim infected localities, as Roman Campagna, etc. It is eliminated by skin, bronchia, kidneys, lungs with more or less irritation, imparting odor to breath and urine.

Fig. 268.



Panax (Aralia) quinquefolium.

Uses.—Intermittent fever, genito-urinary, pulmonary and bladder catarrhs, chronic bronchitis, mucous membrane troubles, asthma (smoked with stramonium). Used when quinine is contra-indicated, intermittents, typhoid, scarlatina, whooping-cough, cancer, hemorrhages. Externally, as antiseptic in ulcers, gonorrhœa, spongy gums, gleet, deodorizer in troubles having disagreeable odor, preventive of putrefaction; spray good in diphtheria, gangrene of lungs, fetid bronchitis. Tincture (1 part) added to cod-liver oil (100 parts) removes fishy flavor; the leaves prevent moths entering woollen cloths; bark used for tanning, dyeing.

Incompatibles: Agents promoting waste, alkalies, mineral acids and salts.

Synergists: Aromatic bitters, antispasmodics, copaiba, cubeb, turpentine, etc.

Allied Plants:

1. *E. amygdali'na, Peppermint Tree.*—Australia; has peppermint-odor, and being more accessible, its foliage is much used for obtaining *eucalyptus kino*, and volatile oil, which oil is claimed to be almost entirely without eucalyptol.

2. *E. dumo'sa.* 3. *E. obli'qua* (Stringy-bark tree). 4. *E. Leuco'xylon* (*sidero'xylon*) (Iron bark tree), and 5. *E. oleo'sa* (Mallee tree).—The yield of these in volatile oil is varying, but Bosisto obtained the following results, which are only of comparative interest, thus for every 100 lbs. (45.5 Kg.) of each variety: No. 1 gave 50 ozs. (1.5 L.), No. 2, 30 ozs. (.9 L.), No. 3, 8 ozs. (.2 L.), No. 4, 16 ozs. (.5 L.), No. 5, 20 ozs. (.6 L.), while the official yielded 12 ozs. (.3 L.).

6. *Ara'lia spino'sa, Hercules' Club, Prickly Elder.*—Araliaceæ. The bark official, 1820–1880. N. America. Prickly tree, 3–9 M. (10–30°) high, leaflets crowded at summit; flowers white; bark in quills, curves, gray, prickly, inside yellowish, aromatic, acrid; contains araliin, volatile oil, resin. Used as stimulant, diaphoretic, demulcent (emetic, cathartic), for rheumatism, skin eruptions, syphilis, colic, dyspepsia, toothache, vomiting, nervousness; externally antidote to rattlesnake bites; in infusion, decoction, tincture, masticatory. Dose, gr. 30–60 (2–4 Gm.).

7. *A. nudicau'lis, Wild, Virginian* or *False Sarsaparilla.*—The root (rhizome) official, 1820–1880. N. America. Small shrub, stem scarcely above ground, leaf single, petiole .3 M. (1°) high; leaflets ovate, serrate, flowers greenish. Root .3 M. (1°) long, 5 Mm. ($\frac{1}{5}'$) thick, annulate, brownish-gray, inside whitish, spongy pith, aromatic odor and taste. Contains volatile oil, resin, starch. Used as stimulant, diaphoretic, alterative—like sarsaparilla, in infusion, decoction. Dose, gr. 30–60 (2–4 Gm.).

8. *Pa'nax quinquefo'lium* (*Aralia quinquefolia*), *Panax, Ginseng.*—The root official, 1840–1880. N. America. Small shrub, .3 M. (1°) high, smooth, leaflets 5's, serrate; flowers yellowish, fruit scarlet; root 5–12.5 Cm. (2–5') long, fusiform, annulate, branched, brownish-yellow, wood yellowish, sweetish, aromatic; contains panaquilon, resin. Used as stimulant, demulcent, stomachic in infusion, decoction, tincture. The *Chinese Ginseng* (*Aralia Gi'nseng*) is very similar to this, slightly larger. Used natively as nervine, aphrodisiac. Dose, ʒss–2 (2–8 Gm.).

RECAPITULATION No. 7.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Anacardiaceæ:								
1. Rhus Glabra. 2. Rhus Glabra (Sumach).	Rhus glabra.	The fruit.	N. America.	Tannin, acid calcium and potassium malates, coloring.	Fluid extract.	Astringent, refrigerant, diuretic.	Catarrhal affections, pharyngitis, aphthæ.	30-60 (2-4 Gm.)
1. Rhus Toxicodendron. 2. Rhus Toxicodendron (Poison Ivy).	Rhus radicans.	The fresh leaves.	N. America.	Toxicodendrol, toxicodendric acid, tannin, fixed oil, mucilage.	....	Irritant, rubefacient, narcotic, poisonous.	Skin affections, rheumatism, paralysis, sprains, stings.	2-5-15 (.13-.3-1 Gm.)
1. Mastiche. 2. Mastic.	Pistacia Lentiscus.	The concrete resinous exudation.	Mediterranean Basin.	Volatile oil, mastichic acid and masticin (resins).	Pills of aloes and mastic.	Mild stimulant, diuretic.	Catarrhs, hemorrhages, fumigation, masticatory.	
Celastraceæ:								
1. Euonymus. 2. Euonymus (Wahoo).	Euonymus atropurpureus.	The bark of the root.	United States.	Euonymin, atropurpurin, asparagin, euonic acid, resins, fixed oil.	Extract.	Laxative, diuretic, tonic, antiperiodic.	Dropsy, constipation, torpid liver, pulmonary troubles.	30-60 (2-4 Gm.)
Sapindaceæ:								
1. Guarana. 2. Guarana.	Paullinia Cupana.	The dried paste from the crushed seed.	N. and W. Brazil.	Caffeine, tannin, resin, volatile oil, fat, saponin.	Fluid extract.	Nervine, stimulant, tonic, astringent.	Sick headache, migraine, diarrhœa of phthisis, convalescence.	15-60 (1-4 Gm.)
Rhamnaceæ:								
1. Frangula. 2. Frangula (Buckthorn).	Rhamnus Frangula.	The bark.	Europe, N. Asia.	Frangulin, emodin, isoemodin, resin, tannin.	Fluid extract.	Purgative, tonic, diuretic, emetic.	Dropsy, costiveness, constipation of pregnancy.	30-60 (2-4 Gm.)
1. Rhamnus Purshiana. 2. Cascara Sagrada (Chittem Bark).	Rhamnus Purshiana.	The bark.	Western U. States.	Purshianin (cascarin), rhamnetin, tannin, 3 resins, (emodin).	Fluid extract.	Purgative, tonic, febrifuge.	Constipation, dyspepsia, hemorrhoids.	15-60 (1-4 Gm.)
Vitaceæ:								
1. Vinum Album. 2. White Wine. 1. Vinum Rubrum. 2. Red Wine.	Vitis vinifera.	Fermented juice of the fruit.	W. Asia. Cult.	Albumin, pectin, tartrates, sulphates, phosphates, chlorides (K, Na, Ca, Mg), sugar.	....	Stimulant, depressant, astringent, tonic, diaphoretic.	Fevers, debility, irritable stomach, tetanus, gangrene.	ad libitum.
Malvaceæ:								
1. Althæa. 2. Althæa (Marsh-Mallow).	Althæa officinalis.	The root.	Europe, W.&N. Asia, (United States).	Asparagin, mucilage, starch, pectin.	Syr. althææ, mas. hydrarg., pil. ferri carb., pil. phosphori.	Demulcent, emollient.	Pulmonary, digestive and urinary inflammation, skin eruptions.	30-60 (2-4 Gm.)

1. Gossypii Radicis Cortex. 2. Cotton Root Bark.	Gossypium herbaceum.	The bark of the root.	Asia, Africa, (United States).	Chromogene, resin, fixed oil.	Fluid extract.	Emmenagogue, oxytocic.	Dysmenorrhœa, amenorrhœa, etc.	30-60 (2-4 Gm.)
1. Gossypium Purificatum. 2. Purified Cotton.	....	The hairs of the seed.	....	Cellulose, fixed oil, inorganics.	Pyroxylin, collodion, styptic, flexible and cantharidal collodions.	Protective.	Dressing to burns, surgical wounds, etc.	
1. Oleum Gossypii Seminis. 2. Cotton-Seed Oil.	....	The fixed oil.	....	Olein, palmitin.		Demulcent, nutritive.	For olive oil, liniments.	
Sterculiaceæ:								
1. Oleum Theobromatis. 2. Oil of Theobroma (Butter of Cacao).	Theobroma Cacao.	The fixed oil.	S. America.	Stearin, laurin, olein, glycerides of formic, acetic, butyric acids.	....	Demulcent, nutrient.	Abraded surfaces, base for suppositories, ointments.	30-60 (2-4 Gm.)
Theaceæ, see *Rubiaceæ*.	Thea sinensis.							
Guttiferæ:								
1. Cambogia. 2. Gamboge.	Garcinia Hanburii.	The gum-resin.	Camboja, Anam, Siam.	Gum, resin (cambogic acid).	Pil. cathar. comp.	Drastic, hydragogue cathartic.	Liver and kidney troubles, vermifuge, dropsy.	½-5 (.03-.3 Gm.)
Thymelæaceæ:								
1. Mezereum. 2. Mezereum (Mezereon).	Daphne Mezereum.	The bark.	Europe.	Daphnin, resin, volatile oil.	Fld. extr., lin. sinapis co., decoc. sars. co., fld. extr. sars. co.	Stimulant, diuretic, diaphoretic, alterative, sialagogue, vesicant.	Syphilis, scrofula, rheumatism, skin diseases.	1-10 (.06-.6 Gm.)
Lythraceæ:								
1. Granatum. 2. Pomegranate.	Punica Granatum.	The bark of the stem and root.	S. W. Asia, India.	Punico-tannic acid, pelletierine, mannit, gum, pectin.	....	Anthelmintic, tænifuge.	Tape and lumbricoid worms.	30-120 (2-8 Gm.)
Myrtaceæ:								
1. Oleum Cajuputi. 2. Oil of Cajuput.	Cajuputi viridiflora.	The volatile oil.	E. India Islands	Cajuputol, hydrocarbons, acetic, butyric, valerianic ethers of terpineol.	....	Carminative, stimulant, diaphoretic, rubefacient.	Rheumatism, affections of stomach, bowels, colic, toothache, bronchitis, dysmenorrhœa.	Minims. 2-10 (.13-.6 Cc.)
1. Caryophyllus. 2. Cloves.	Eugenia aromatica.	The unexpanded flowers.	Molucca (Clove) Islands.	Volatile oil, tannin, gum, resin, caryophyllin, eugenol.	Tinct. lavend. comp., tinct. rhei ar., vin. opii, Oil.	Stimulant, stomachic, antispasmodic, rubefacient.	Nausea, colic, condiment, rheumatism, neuralgia, toothache.	Grains. 5-15 (.3-1 Gm.)
1. Pimenta. 2. Pimenta (Allspice).	Pimenta Pimenta (officinalis).	The nearly ripe fruit.	C. and S. America.	Volatile oil, resin, fixed oil, tannin.	*Oil:* spirit myrica.	Stomachic, stimulant, carminative, condiment.	Flatulence, nausea, colic, rheumatism, neuralgia.	5-30 (.3-2 Gm.)
1. Oleum Myrciæ. 2. Oil of Myrcia (Oil of Bay).	Pimenta (Myrcia) acris.	The volatile oil.	W. Indies.	Terpenes, eugenol, methyl-eugenol.	Spirit.	Astringent, stimulant, perfume, tonic.	Nervous headache, faintness, chafing, irritated parts, hair washes, perfumery.	Externally.
1. Eucalyptus. 2. Eucalyptus.	Eucalyptus globulus.	The leaves.	Australia.	Volatile oil, tannin, cerylic alcohol, fatty acid, resins.	Fluid extract, oil, eucalyptol.	Febrifuge, stimulant, astringent, antiseptic, diaphoretic.	Intermittents, urinary and pulmonary troubles, bronchitis, hemorrhages, gleet, ulcers.	Grains. 15-60 (1-4 Gm.)

64. UMBELLIFERÆ. Parsley (Carrot) Family.

Um-bel-lif′e-re. L. *Umbellifer-æ—umbella*, umbel, + *ferre*, to bear; *i. e.*, flowers borne in umbels. Herbs, shrubs. Distinguished by possessing aromatic, stimulant volatile oils; flowers in umbels; stems hollow; leaves usually compound; fruit cremocarp, with oil-tubes (vittæ), indehiscent; calyx adnate to ovary; petals and stamens 5, inserted on fleshy epigynous disk; ovary 2-celled, inferior; seeds 1 in each carpel, albumin horny; temperate climates; aromatic, carminative, stimulant, tonic (vol. oil), narcotic, poisonous (acrid juice), antispasmodic (gum-resin).

Genera: 1. **Fœniculum.** 2. **Pimpinella.** 3. **Carum.** 4. **Coriandrum.** 5. **Conium.** 6. **Ferula.** 7. **Dorema.**

FŒNICULUM. FENNEL.

Fœniculum Fœniculum, (*Linné*) *Karsten.*
(**Fœniculum capillaceum,** *Gilibert.*) } The fruit.

Habitat. S. Europe, W. Asia. Cultivated.

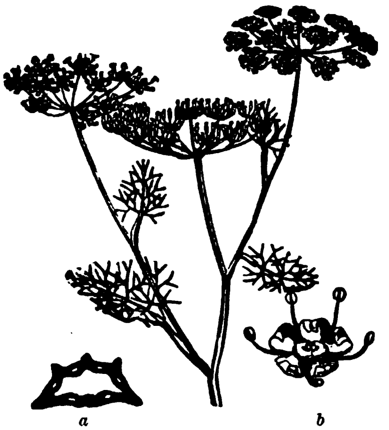
Syn. Large—Sweet or Wild Fennel, Fennel Seed—Fruit, Semen—Fructus Fœniculi. Fr. Fenouil, Fruits (Semences) de Fenouil. Ger. Fenchel (semen, fructus).

Fœ-nic′u-lum. L. fennel, dim. of *fenum* or *fœnum*, hay; *i. e.*, from a resemblance in odor.

Cap-il-la′ce-um. L. *capillaceus*, hairy—very slender, like a hair; *i. e.*, the leaflets very long and narrow.

Plant.—Large, perennial (biennial, annual) herb; stem .6–1.2 M. (2–4°) high, furrowed, green, glaucous, branched; rootstock thick; leaves twice pinnate, pinnæ very narrow, often only as wide as the thin petiole; flowers yellow, 15–20 in umbels, all parts with agreeable aromatic odor; sweet, aromatic taste. Fruit, cremocarp, oblong, nearly cylindrical, slightly curved, 4–8 Mm. ($\frac{1}{6}$–$\frac{1}{3}$′) long, brownish or greenish, separable into two prominent mericarps, each with 5 light-brown, obtuse ribs and 4 oil-tubes on the back, 2 or 4 on the flat face; odor and taste aromatic, anise-like. *Solvents:* alcohol (hot water partially) extracts the virtues depending upon volatile oil. Dose, gr. 10–30 (.6–2 Gm.).

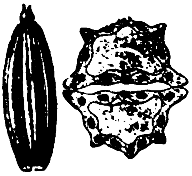
Fig. 269.



Fœniculum Fœniculum (capillaceum); *a*, cross-section of fruit; *b*, flower with stamens.

Commercial.—Fennel is a very variable plant as to size, habit, shape, number of rays in umbels and shape of fruit. This results from the fact that the wild *F. vulga′re* has been under cultivation for centuries, consequently the natural outgrowth has been several well-marked new species. In Italy fennel is grown for the fruit and the young shoots for eating purposes. That cultivated in S. France, Germany, etc., is called sweet or Roman fennel, has its fruit twice as long as the official, and often curved. This by continued cultivation reverts, however, to the original wild form, and hence cannot properly be considered a new species, *F. sati'vum;* some refer it to *F. du'lce,* which, however, is a much smaller plant.

FIG. 270.



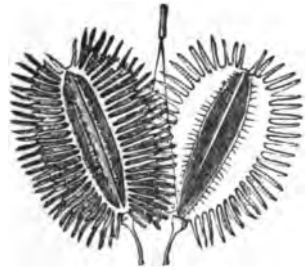
Fœn'culum fruit, 3 diam.; transverse section, 8 diam.

There are several varieties: 1. *German, Saxon* (*F. Fœniculum* (*capillaceum*)). 2. *Sweet, Roman* (*F. sativum, F. dulce* (*?*)). 3. *Wild, Bitter* (*F. vulgare*). Sometimes these are sold as *longs* and *shorts,* the former then being preferred. We are supplied by Germany and our own country. The root has been used in medicine, but with less satisfaction.

CONSTITUENTS.—Volatile oil 2–6 p. c., fixed oil 12 p. c., (sugar, mucilage, ash 7 p. c.).

Oleum Fœniculi. Oil of Fennel, *official.*—(Syn., Fr. Essence de Fenouil; Ger. Fenchelöl.) This volatile oil, obtained by distilling fruit (or entire plant) with water or steam, is a pale-yellowish liquid chemically, almost identical with anise oil, but has characteristic odor and taste; sp. gr. 0.965, usually solidifies at 5–10° C. (41–50° F.), soluble in equal volume alcohol, or glacial acetic acid. Contains (about the same as oil of anise) pinene, phellandrene, $C_{10}H_{16}$ (substance isomeric with oil of turpentine), dipentene, (sometimes limonene), fenchone (a camphor), $C_{10}H_{16}O$, and anethol, $C_{10}H_{12}O$, 60 p. c. This latter consists of two portions, one liquid—an eleopten—another solid—a stearopten—and the percentages of these two are not always uniform, some specimens of oil having more of the solid, while others (best) more of the liquid anethol. This oil from different sources is usually without some of these (either phellandrene, fenchone or anethol), and should be kept cool, in well-stoppered bottles, and when congealed must be perfectly liquefied by heat before being dispensed. *Tests:* 1. Alcoholic solution should not be colored blue or dark by 1 drop ferric chloride T. S. (abs. foreign oils containing carbolic acid). 2. Oil when dropped into water and not shaken should produce no milkiness (abs. of alcohol). 3. When triturated with sugar and water should give pure fennel-odor. Dose, ♏ij–5 (.13–.3 Cc.).

FIG. 271.



Daucus Carota; magnified 5 times.

PREPARATIONS.—I. FRUIT: 1. *Infusum Sennæ Compositum,* 2 p. c. Dose, ℥j–3 (30–90 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ♏x–30 (.6–2 Cc.). *Syrup. Infusion,* 5 p. c. Dose, ʒj–16 (4–60 Cc.).

II. OIL: 1. *Aqua Fœniculi.* Fennel Water. (Syn., Fr. Eau de Fenouil; Ger. Fenchelwasser.)

Manufacture: $\frac{1}{5}$ p. c. Triturate oil .2 Cc. with precipitated calcium phosphate .4 Gm., adding distilled water gradually q. s. 100 Cc. Dose, *ad libitum.*

2. *Pulvis Glycyrrhizæ Compositus,* $\frac{2}{5}$ p. c. Dose, ʒss–2 (2–8 Gm.).

3. *Spiritus Juniperi Compositus,* $\frac{1}{20}$ p. c. Dose, ʒj–4 (4–15 Cc.).

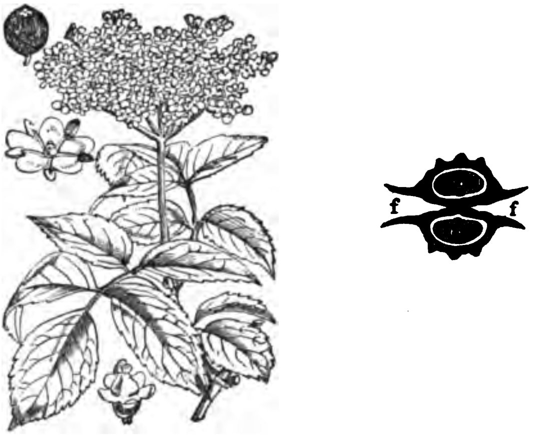
PROPERTIES.—Carminative, stimulant, stomachic, galactagogue; employed by the ancients very similarly.

USES.—Nausea, colic, amenorrhœa, lacteal secretion, infantile flatulency. It increases the secretion of milk, perspiration, mucus, urine. As a corrective to griping medicines, senna, rhubarb, etc. Much used in cattle medicines; the oil in cordials, elixirs.

Allied Plants:

1. *Dau'cus Caro'ta, Carrot* (*Seed*).—The fruit official, 1820–1880. N. Asia, Europe; biennial herb, .6–1 M. (2–3°) high, hispid; flowers July–September, white; root fleshy, fusiform, aromatic, edible; fruit 4 Mm. ($\frac{1}{6}$′) long, oval, flat, grayish-brown, each mericarp with 9 ribs, 6 oil-tubes; odor aromatic; taste pungent. Contains volatile oil, fixed oil. Used as stimulant, diuretic, excitant, for dropsy, strangury, nephritic affections, amenorrhœa, ulcers, sores, eczema, itching; in infusion, fluid extract. Dose, gr. 10–30 (.6–2 Gm.).

FIG. 272.



Angelica flowering stem and cross-section of cremocarp; *a*, the seed; *f*, the two ribbed wings (mericarps).

2. *Ange'lica Archange'lica* (*officina'lis*), *European Angelica.*—The root official, 1860–1870, and *Angelica atropurpu'rea, American* (*Purple-stemmed*) *Angelica.* The root official, 1820–1860. Herbs, 1.8–2 M. (5–6°) high; stems purplish, smooth, hollow, jointed; leaves double pinnate; flowers greenish-white; roots 5–10 Cm. (2–4′) long, 2.5–5 Cm. (1–2′) thick, annulate, fusiform, juicy, aromatic, sweetish, pungent, bitter. Contains volatile oil, resin, valerianic acid; used as tonic, stimulant, carminative, diaphoretic, emetic, for typhoid condition, bronchitis, intermittents, rheumatism, gout, painful and swollen parts,

condiment; in infusion, tincture, fresh juice (poisonous). Dose, gr. 10–30 (.6–2 Gm.).

3. *Heracle'um lana'tum, Cow-Parsnip, Masterwort.*—The root official, 1820–1860. United States; plant 1.5–3 M. (5–10°) high, 2.5–4 Cm. (1–1½′) thick, pubescent, hollow; root resembles parsley, disagreeable odor, acrid taste, fruit has each mericarp with 5 ribs and 6 oil-tubes; contains volatile oil, resin. Used as stimulant, carminative, for epilepsy, dyspepsia, warts, escharotic; in infusion, juice. Dose, ʒss–1 (2–4 Gm.).

4. *Eryn'gium aqua'ticum (yuccæfo'lium), Button Snakeroot.*—The root official, 1820–1860. United States. Plant .6–1.8 M. (2–6°) high, leaves rigid, pointed, .3–1 M. (1–3°) long, bristly; flowers white; root tuberous, 6–12 Mm. (¼–½′) long, branched, cup-shaped scars, central pith, aromatic; taste sweet, acrid, aromatic, resembles parsnip; contains volatile oil. Used as diaphoretic, expectorant, sialagogue, emetic for dropsy, gravel, jaundice, substitute for senega; in infusion, decoction, tincture. Dose, ʒss–1 (2–4 Gm.).

ANISUM. ANISE.

Pimpinella Anisum, *Linné.* } The fruit.

Habitat. W. Asia, Egypt, S. E. Europe, cultivated in S. Europe, United States, in gardens.

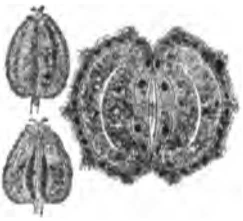
Syn. Aniseed, Aneys, Aunyle, Common Anise, Sweet Cumin, Fructus (Semen) Anisi. Fr. Anis, Anis vert, Graines d'Anise. Ger. Anis, Anissame.

Pim-pi-nel′la. L. Medieval name, altered from *bipinnate* or *bipinnella; i. e.*, the pinnate leaves; lit. "the two-winged little plant."

An′i-sum. L. fr. Gr. *ἀνισον—ἀνηθον*, Ar. *Anisum*, Anise. Dill; *i. e.*, classic name.

Plant.—Annual herb .3 M. (1°) high; leaves dentate, pinnatifid; flowers white, small, umbels 8–14-rayed. Fruit, cremocarp 5 Mm. (⅕′) long, ovate, compressed at sides, grayish, hairy, mericarps two, flat-faced, each with 5 brownish filiform ribs (ridges), 12–20 oil-tubes; odor, taste aromatic. *Solvents:* alcohol; boiling water partially. Dose, gr. 10–30 (.6–2 Gm.).

Fig. 273.



Anisum; fruit and longitudinal section magnified 3 diam., transverse section magnified 8 diam.

Adulterations.—Earthy fragments, but chiefly with *Conium maculatum* fruit (which resembles mostly the Russian Anise), but odor and taste are not aromatic; non-hairy; consisting usually of single, smooth, mericarps, grooved upon the face, crenate ridges with wrinkles between them; no oil-tubes.

Commercial.—Plant was known and cultivated by Romans; Theophrastus writes of its aromatic properties. Now mostly grown in Malta, Spain, Italy (exported via Leghorn), C. and S. Russia (short) and Chili. The Spanish (Alicante variety), though smaller than French or German, is preferred; that grown by us supplies mostly our market.

Constituents.—Volatile oil 1–3 p. c., fixed oil 3–4 p. c., choline, resin, sugar, mucilage, malates, phosphates, ash 7 p. c.

Oleum Anisi. Oil of Anise, *official.*—(Syn., Fr. Essence d'Anis; Ger. Anisöl.) This volatile oil, obtained by distilling fruit with water or steam, is a colorless, yellowish, thin, refractive liquid, characteristic anisic-odor; sweet, mildly aromatic taste, sp. gr. 0.985; increasing with age, solidifies between 10–15° C. (50–59° F.) into white crystals. Contains a terpene—phellandrene, $C_{10}H_{16}$, 10–20 p. c., a stearopten—anethol, $C_{10}H_{12}O$ (upon which the value solely depends), 80–90 p. c., by oxidation with nitric acid converted into anisic acid. *Tests:* 1. Should be clear in equal volume alcohol (abs. most fixed oils, oil of turpentine). 2. This solution is neutral and should not be blue or brownish with 1 drop ferric chloride T. S. (abs. volatile oils containing phenols). 3. When dropped into water should not cause milkiness unless agitated (abs. alcohol), and alcoholic solution of oil with hydrochloric acid gives pink color. Dose, ♏ij–5 (.13–.3 Cc.).

Adulterations.—Spermaceti (5–35 p. c.), wax, fixed oils, oil of turpentine, camphor (to raise congealing point), alcohol, fenchone (fennel stearopten). The two former insoluble in cold alcohol, whereas oils and camphors are mostly soluble. Camphors recognized by odor, alcohol by giving milkiness to water. Star-anise oil is the same as this chemically, but has a slight distinguishing smell and taste, also lower congealing point.

Preparations.—I. Fruit: 1. *Tinctura Rhei Dulcis*, 4 p. c. Dose, ʒij–4 (8–15 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ♏x–30 (.6–2 Cc.). *Infusion*, 5 p. c. Dose, ʒj–8 (4–30 Cc.).

II. Oil: 1. *Aqua Anisi.* Anise Water. (Syn., Fr. Eau d'Anis; Ger. Aniswasser.)

Manufacture: $\frac{1}{5}$ p. c. Triturate oil .2 Cc. with precipitated calcium phosphate .4 Gm., adding distilled water gradually q. s. 100 Cc. Dose, *ad libitum.*

2. *Spiritus Anisi.* Spirit of Anise. (Syn., Br. Essentia Anisi; Fr. Alcoolat (Esprit) d'Anis; Ger. Anisgeist.)

Manufacture: 10 p. c. Dissolve oil 10 Cc. in deodorized alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

3. *Spiritus Aurantii Compositus*, $\frac{1}{2}$ p. c. Dose, *ad libitum* (vehicle).

4. *Elixir Phosphori*, $\frac{1}{5}$ p. c. Dose, ʒss–2 (2–8 Cc.).

5. *Syrupus Sarsaparillæ Compositus*, $\frac{1}{100}$ p. c. Dose, ʒj–4 (4–15 Cc.).

6. *Tinctura Opii Camphorata*, $\frac{2}{5}$ p. c. Dose, ʒss–2 (2–8 Cc.).

7. *Trochisci Glycyrrhizæ et Opii*, ♏$\frac{1}{33}$ (.002 Cc.) in each. Dose, 1–4 troches.

Properties.—Aromatic stimulant and carminative, stomachic, once supposed a galactagogue, now doubted, although it does impart peculiar taste to secreting milk.

Uses.—Flatulent colic, bronchitis, infantile catarrh. As a corrigent to griping cathartics, but here fennel is preferred; much used for flavoring food, confectionery, and in veterinary practice.

Allied Plant:

1. *Ane'thum* (*Peuceda'num*) *grave'olens*, *Dill Fruit* or *Seed.*—S. Europe, Asia. Herb .6 M. (2°) high; leaves finely divided, glaucous; flowers yellow; fruit oblong, 4 Mm. ($\frac{1}{6}$′) long, brown, smooth, mericarps two, flat-faced, each having 5 ribs, 6 oil-tubes, of which 3 are filiform, 2 lateral ones broadly winged, light-colored, odor, taste spicy, caraway-like; contains volatile oil, fixed oil. Used as carminative, stimulant, stomachic; as a substitute for anise for flatulent colic, hiccough, indigestion. Dose, gr. 10–30 (.6–2 Gm.); volatile oil, ♏ij–5 (.13–.3 Cc.).

CARUM. CARAWAY.

Carum
Carvi (Carui), *Linné.* } The fruit.

Habitat. C. and W. Asia, Himalayas, Caucasus, Europe, Siberia; cultivated in England, Norway, Russia, Germany, Holland, United States.

Syn. Caraway (Fruit) Seed. Br. Carui Fructus. Fr. Carvi, Cumin des Prés. Ger. Fructus Carvi, Kümmel, Gemeiner Kümmel.

Ca'rum. L. *careum*, fr. Gr. *κάρον*, after Caria in Asia Minor; *i. e.*, its original habitat. *Carui* was the name used by medieval pharmacists for the drug.

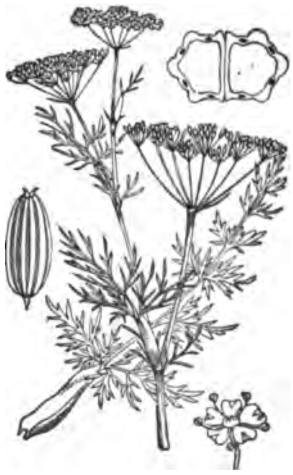
Car'vi. L. for *carvy*, *carvey*. Ar. *Karawya*, Eng. Caraway. Here frequently the word *Carui* is used, thus assimilating L. gen., as though for *Carui Semina.*

PLANT.—Biennial herb; stem .3–1 M. (1–3°) high, hollow; leaves bi- or tripinnate, deeply incised; flowers May–June, small, white, no involucre; root fusiform, fleshy, white, resembles parsnip, and used as food in N. Europe. FRUIT, 2-seeded cremocarp, oblong, flattened, 4 Mm. ($\frac{1}{6}$′) long, brown, mericarps two, curved, narrowed at both ends, with 5 yellowish filiform ribs, 6 oil-tubes, pentagonal upon transverse section; odor agreeable; taste sweet, spicy. *Solvents:* alcohol; water partially. Dose, gr. 10–30 (.6–2 Gm.).

ADULTERATIONS.—With allied and occasionally exhausted (drawn) fruits.

Commercial.—Fruit ripens in Aug. of the second year, when plant is cut down, dried, and thrashed on a cloth. We have several varieties: 1. *English*, 2. *German*, 3. *Dutch*, 4. *Mogador*, 5. *American.* This last results from cultivating the plant in our gardens; the fruit is aromatic, smaller than German, but with this latter comprises nearly our total supply. The English are the shortest, the Mogador the longest and lightest.

FIG. 274.

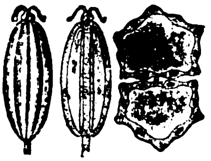


Carum Carvi (Carui).

CONSTITUENTS.—Volatile oil 5–7 p. c., fixed oil, resin, sugar, mucilage, tannin, ash 5 p. c.

Oleum Cari. Oil of Caraway, *official.*—(Syn., Br. Oleum Carui; Fr. Essence de Carvi; Ger. Kümmelöl.) This volatile oil, obtained by distilling the fruit with water or steam, is a pale-yellow, thin liquid, characteristic odor, mild spicy taste, sp. gr. 0.915, soluble in equal volume alcohol, brown by age, with ferric chloride gives reddish or violet color. Contains a terpene—carvene, $C_{10}H_{16}$, 35–50 p. c. (chemically identical with citrene, hesperidene, and dextrogyrate limonene), and mostly a ketone —dextrogyrate carvol, $C_{10}H_{14}O$, 50–65 p. c.; this latter is a liquid of caraway-odor, obtained by treating the oil with alcoholic solution of ammonium sulphide and decomposing the resulting crystals with potassa. It is closely related to menthol and myristicol and identical with thymol, cuminic alcohol and carvacrol, this latter being obtained by distilling a mixture of caraway oil and potassa or soda, thus expelling carvene, decomposing residue by sulphuric acid, rectifying. It is a viscid, yellowish oil, creosote-odor and taste, useful in toothache, by inserting it into the cavity.

FIG. 275.

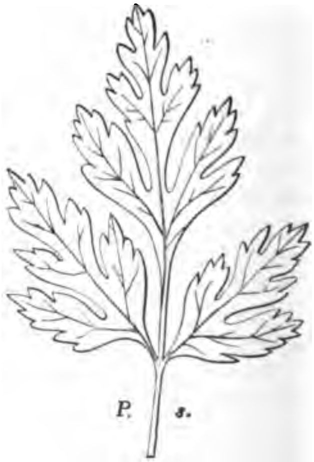


Carum; fruit and longitudinal section, 3 diam.; transverse section, 8 diam.

PREPARATIONS.—I. FRUIT: 1. *Tinctura Cardamomi Composita,* 1 p. c. Dose, ʒj–2 (4–8 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ♏x–30 (.6–2 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Water* (*Aqua*). *Spirit* (*Spiritus*).

FIG. 276.



Apium (Carum) Petroselinum; pinnate leaf.

II. OIL: 1. *Spiritus Juniperi Compositus,* $\frac{1}{20}$ p. c. Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Carminative, stimulant, diuretic, stomachic.

USES.—Flatulent colic, especially for infants, corrective to nauseous purgatives, flavoring, toothache (carvacrol), as a spice in cakes, bread, etc. The oil is mostly used, which acts externally like other essential oils, as an anæsthetic, etc.

Allied Plants:

1. *A'pium* (*Ca'rum*) *Petroseli'num, Common* or *Garden Parsley.*—The root official, 1820–1880. S. Europe, cultivated as a garden plant. Annual herb, .6–1.2 M. (2–4°) high, with radical and cauline leaves, 3-pinnate; flowers yellow; fruit 2 Mm. ($\frac{1}{12}'$) long, ovate, greenish-brown, mericarps with 5 ribs, 6 oil-tubes; contains volatile oil, resin, fixed oil, apiin, (glucoside), $C_{24}H_{28}O_{13}$, apiol (parsley camphor), cariol; root conical, 15 Cm. (6′) long, 12 Mm. ($\frac{1}{2}'$) thick, yellowish, contains volatile oil, apiin, starch. Used as diuretic, nephritic, carminative, discutient for dropsy, gravel, strangury, gonorrhœa, neuralgia, amenorrhœa, in infusion, tincture. Dose, ʒss–1 (2–4 Gm.). *Apiol* is an

oleoresin, obtained by percolating fruit with alcohol, reclaiming and separating oily residue from the deposited waxy solid; as such it is a greenish oily liquid, which may be made to form white crystals, $C_{12}H_{14}O_4$, known as white apiol. Dose, ♏ or gr. 5–8 (.3–.5 Gm.), in dysmenorrhœa, amenorrhœa, beginning 3–4 days before coming menstruation.

2. *A′pium grave′olens*, *Celery* (*Fruit*).—S. Europe, cultivated. Fruit 1 Mm. ($\frac{1}{25}$′) long, ovate, flattened, brown, smooth, mericarps two, 5 ribs, 12 oil-tubes; contains volatile oil, fixed oil; root, fusiform, white, when wild poisonous; under cultivation, harmless; blanched stalks popular as a salad. Used as carminative, stimulant, flavoring (in infusion, juice), for bronchitis, intermittents, contusions, swollen glands. Dose, gr. 15–30 (1–2 Gm.).

CORIANDRUM. CORIANDER.

Coriandrum sativum, *Linné.* } The fruit.

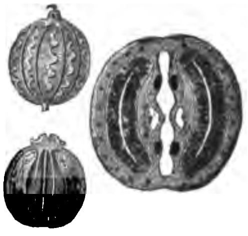
Habitat. C. Asia, S. Europe (China, Italy; cultivated in United States, Europe).
Syn. Coliander. Br. Coriandri Fructus. Fr. Coriandre. Ger. Koriander.

Co-ri-an′drum. L. fr. Gr. κόρις, a bug; *i. e.*, from a resemblance in odor of the leaves.

Sa-ti′vum. L. *sativus*, sown, cultivated; *i. e.*, kind used in contra-distinction to the wild-grown.

PLANT.—Annual herb, offensive odor of bed-bugs; stem .3–.6 M. (1–2°) high, solid; leaves bi- or tripinnate; leaflets linear, pointed, lobed, light-green, resembling parsley; flowers June, white, rose-colored, umbels small, 4 Cm. (1½′) broad, 5–8-rayed. FRUIT, Aug., cremocarp, globular, 4 Mm. (⅛′) thick, crowned with calyx-teeth and stylopod, brownish-yellow, with slight longitudinal ridges, two mericarps cohering, enclosing lenticular cavity, each having on the face 2 oil-tubes; odor and taste agreeably aromatic. *Solvents:* alcohol; water partially. Dose, gr. 10–30 (.6–2 Gm.).

FIG. 277.



Coriandrum; fruit and longitudinal section magnified 3 diam., transverse section magnified 8 diam.

ADULTERATIONS. — Stems, fragments of leaves; the oil with oil of orange, oil of turpentine, terpenes.

Commercial.—Coriander was popular with the ancients. In the fresh state all parts upon being bruised are fetid; the fruit becomes fragrant only by drying, and when ripe, plants are cut down with sickles, dried, and fruit thrashed out. We produce largely our own supply, but they are imported from Europe, although those from Bombay are larger.

CONSTITUENTS.—Volatile oil ½–1 p. c., fat 13 p. c., tannin, malic acid, mucilage, ash 5 p. c.

Oleum Coriandri. Oil of Coriander, *official.*—(Syn., Fr. Essence de Coriandre; Ger. Korianderöl.) This volatile oil, distilled from fruit with water or steam, is a yellowish liquid, characteristic, aromatic odor, warm, spicy taste; sp. gr. 0.875, soluble in alcohol and equal quantity glacial acetic acid. Consists of a terpene—pinene, $C_{10}H_{16}$, and (chiefly) an alcohol—linalool (coriandrol), $C_{10}H_{18}O$, from which one molecule H_2O can be withdrawn, leaving $C_{10}H_{16}$. *Test:* 1 Cc. oil + 3 Cc. alcohol 75 p. c., should give clear solution (abs. oil of turpentine, oil of orange, terpenes). Should be kept cool, in well-stoppered bottles. Dose, ♏ij–5 (.13–.3 Cc.).

PREPARATIONS.—I. FRUIT. (Unoff.) *Fluid Extract.* Dose, ♏xv–30 (1–2 Cc.). *Infusion,* 5 p. c. Dose, ℥j–2 (30–60 Cc.).

II. OIL: 1. *Confectio Sennæ,* ½ p. c. Dose, ʒj–2 (4–8 Gm.).

2. *Spiritus Aurantii Compositus,* 2 p. c. Dose, as a flavoring.

3. *Syrupus Sennæ,* ½ p. c. Dose, ʒss–4 (2–15 Cc.).

PROPERTIES.—Aromatic, carminative, stimulant, stomachic.

USES.—Indigestion, flatulency, corrective to griping medicines, such as senna, rhubarb, jalap; flavoring to gin and in cooking. Oil also used in colic, rheumatism, neuralgia.

CONIUM. CONIUM (HEMLOCK).

Conium maculatum, *Linné.* } The full grown fruit, gathered while yet green.

Habitat. Europe, Asia, N. Africa (naturalized in N. and S. America, waste places and along streams—England, Scotland, Greece, Italy, Spain, United States).

Syn. Poison Hemlock—Root—Parsley or Snakeweed, Spotted Hemlock—Conium—Cowbane or Parsley, Beaver Poison, Musquash Root, Water Parsley, Wild or Water Hemlock, Cicuta. Br. Conii Fructus. Fr. Grand Ciguë, Ciguë officinale or ordinaire. Ger. Herba Conii, Schierling, Gefleckter Schierling.

Co-ni'um. L. fr. Gr. *κώνειον—κωνάω,* to whirl around; *i. e.,* it produces giddiness when taken.

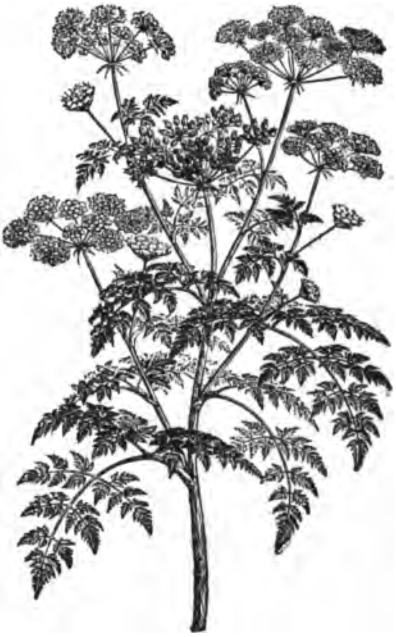
Mac-u-la'tum. L. *maculatus,* spotted, fr. *macula,* a spot; *i. e.,* stem has brownish-purple dots.

PLANT.—Biennial, stem 2–2.5 M. (6–8°) high, round, furrowed, hollow, smooth, green, mottled with port-wine colored spots, covered with white bloom; root whitish-yellow, fusiform, 12–18 Mm. (½–¾') thick, exuding a milky juice when cut; flowers June–July, white, small umbels 10–20-rayed; leaves bipinnate, 15–30 Cm. (6–12') long, pinnæ lanceolate, incised, dentate, mucronate, glossy beneath, grayish-green upon drying; odor of mice urine; taste nauseous, saline, bitter, acrid. FRUIT, cremocarp, 3 Mm. (⅛') long, ovate, laterally compressed, grayish-green, smooth, two mericarps, each with 5 crenate ribs, no oil-tubes, but containing a seed grooved on the face; odor and taste slight, when triturated with solution of potassa or soda get disagreeable mouse urine odor. *Solvent:* alcohol. Dose, gr. 1–5 (.06–.3 Gm.).

ADULTERATIONS.—With several umbelliferous fruits, especially anise, which has similar appearance but is aromatic, with two mericarps flat-faced, and 12–20 oil-tubes.

Commercial.—This was the *χώνειον* of Greek writers, and the celebrated Athenian *State poison* in the form of decoction or juice. By this Socrates, Phœcion, and many others died. Virgil and other Latin authors spoke of it as *cicuta*. Plants of dry, hot climates, in sunny exposures, are most active; collect fruit in Aug., dry in the dark, and keep unexposed in tight vessels, when they will remain active several years.

FIG. 278.



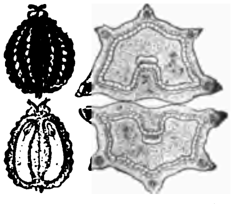
Conium maculatum.

CONSTITUENTS.—Conine $\frac{1}{5}$–$\frac{1}{2}$ p. c., Methylconine, Conydrine, pseudoconydrine, $C_8H_{17}NO$, volatile oil, fixed oil, conic (coniic) or malic acid, ash 6 p. c.[1]

Conine (Coniine), $C_8H_{17}N$.—This liquid alkaloid exists combined with malic or conic acid and is obtained by distilling with an alkali when it comes over with the volatile oil, or add alkali (ammonia) to the drug or the extract and distil; neutralize distillate with H_2SO_4, evaporate to syrup, add alcohol to dissolve alkaloids thereby precipitating ammonium sulphate, evaporate filtrate, and liberate conine by distilling with alkali (potassa) when comes over with it methylconine and conydrine unless very careful. It is a yellowish, oily liquid, sp. gr. 0.880, boiling at 168° C. (335° F.), acrid taste, odor of cat or mice urine, forming white crystalline salts soluble in water, alcohol (hydrobromate, hydrochlorate, sulphate, etc.). Dose, ♏$\frac{1}{20}$–$\frac{1}{6}$ (.003–.01 Cc.); salts, gr. $\frac{1}{20}$–$\frac{1}{6}$ (.003–.01 Gm.).

Methylconine, $C_8H_{16}CH_3N$.—Resembles conine, with which commercial alkaloid it is usually associated.

FIG. 279.



Conium; fruit and longitudinal section magnified 3 diam., transverse section magnified 8 diam.

Conydrine (Oxy-conine), $C_8H_{17}NO$.—May be separated from conine by exposing mixed alkaloids to a freezing mixture, expressing, crystallizing repeatedly from ether; occurs in iridescent scales, less poisonous than conine, with P_2O_5 yields poisonous coniceine, $C_8H_{15}N$.

PREPARATIONS.—1. *Extractum Conii.* Extract of Conium. (Syn., Extractum Conii Alcoholicum; Fr. Extrait Alcoolique de Semence (fruit) de Ciguë; Ger. Spirituöses Schierlingsfrucht-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol 98 Cc., acetic acid 2, finishing with former alone q. s. Dose, gr. $\frac{1}{2}$–2 (.03–.13 Gm.).

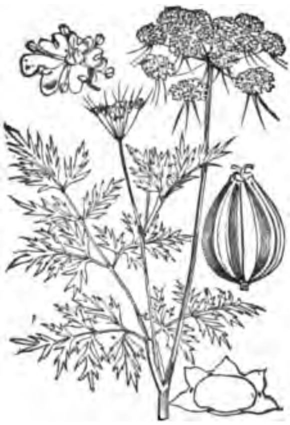
2. *Extractum Conii Fluidum.* Fluid Extract of Conium. (Syn., Extractum Conii Fructus Fluidum, Fluid Extract of Hemlock Fruit; Fr. Extrait liquide de Semence (fruit) de Ciguë; Ger. Flüssiges Schierlingsfrucht-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol 98 Cc., acetic acid 2, finishing with former alone q. s. 100 Cc. Dose, ♏j–5 (.06–.3 Cc.).

Unoff. Preps.: Tincture, 15 p. c. Dose, ♏x–60 (.6–4 Cc.). *Abstract.* Dose, gr. ½–2 (.03–.13 Gm.). *Extract,* Br. (inspissated juice of fresh herb, like that of aconite, belladonna, etc.; yield 3–4 p. c.). *Succus,* Br., expressed juice of fresh leaves (alcohol 1 part + leaves 3, macerate a week, filter, keep cool). Dose, ʒss–2 (2–8 Cc.). *Cataplasm,* Br. (powdered leaves 1 part, flaxseed meal 3, hot water 10).

PROPERTIES.—Sedative, narcotic (used by ancients as such, fell into neglect and was revived by Störck), poisonous (no effect on horses, goats, sheep), anodyne, soporific, antispasmodic, anaphrodisiac. It mainly depresses functional activity of all motor nerves, beginning in the peripheries, then ascending and involving spinal cord, thereby causing motor paralysis without loss of sensation. Poisonous doses produce vomiting, fatigue or heaviness of the legs, numbness, dropped eyelids, mydriasis, vertigo, impaired speech, slow, difficult breathing, paralysis of voluntary muscles, first of lower limbs, loss of speech and vision, and finally death from paralysis of respiratory muscles. Heart and mind not affected.

FIG. 280.



Æthusa Cynapium.

USES. — Spasmodic chorea, whooping-cough, mania, melancholy, neuralgia, delirium tremens, tetanus, asthma, epilepsy, convulsions, phthisis, bronchitis, pneumonia, pleurisy, when excessive motor activity present; externally scrofulous, glandular sores, mammary gland trouble, to dry up milk, cutaneous affections, toothache, usually in form of poultice.

Poisoning: Emetics or lavage, tannin, then wash stomach again, strychnine, picrotoxin, alcoholic stimulants, coffee, atropine (hypodermically), external warmth and epispastics.

Incompatibles: Tannic acid, caustic alkalies, vegetable acids, astringents, strychnine, picrotoxin.

Synergists: Motor depressants (aconite, veratrum, gelsemium, tobacco, hydrocyanic acid), morphine, etc.

Conii Folia, Conium Leaves.—Official, 1820–1880. These should be collected while plant is in bloom, foot-stalks rejected, and carefully dried by sun or fire (49° C.; 120° F.). Must then be kept tightly in tin boxes or, better, powdered and put in well-stoppered bottles, otherwise conine, being very volatile, escapes, leaving a worthless product.

Allied Plant:

1. *Æthu'sa Cyna'pium, Fool's Parsley, Small Hemlock.*—Leaves non-poisonous, and sometimes carelessly mixed with those of conium. Plants are easily distinguished, as this has leaves of different shape, darker color, leek-like odor. Occasionally we have also mixed the pubescent ciliate leaflets of several species of *Chærophy'llum.*

ASAFŒTIDA. ASAFETIDA.

Ferula fœtida, (*Bunge*) *Regel.* } The gum-resin from the root.

Habitat. Persia, Turkestan, Afghanistan.

Syn. Devil's Dung, Food of the Gods, Cibus Deorum, Gummi-resina Asafœtida. Fr. Asse-fétide. Ger. Asa fœtida, Asant, Stinkasant, Teufelsdreck.

Fer'u-la. L. fr. *ferio,* to strike; *i. e.,* stems used as rods, with which, at one time, school boys were punished.

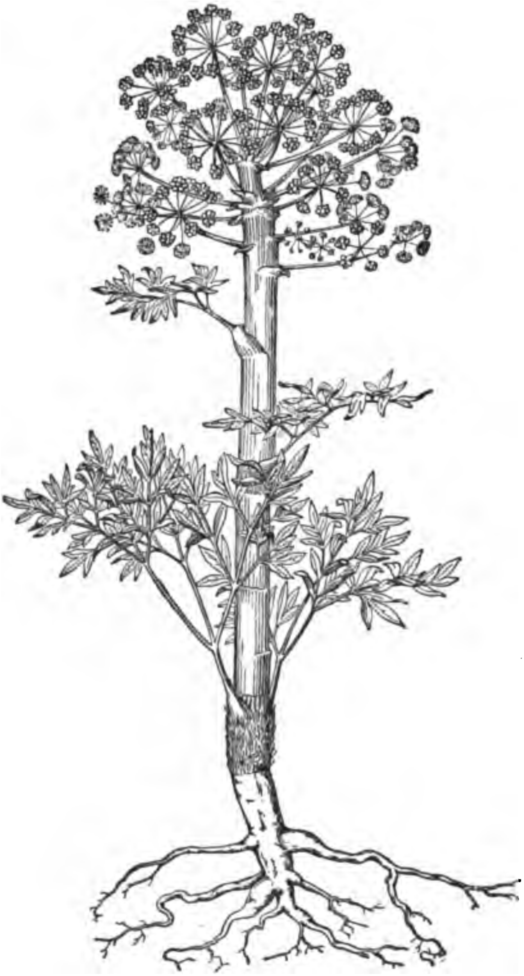
Fœ'ti-da. L. *fœtidus,* fetid, stinking, with Pers. prefix *aza,* mastic, forms the official and common name; *i. e.,* the odor of the plant, and its secretion.

PLANT.—This particular species was discovered by Lehmann, 1841, in Turkestan and Bokhara, and by Bunge, 1858 (*Scorodo'sma fœ'tidum*), in W. Afghanistan; it is a large, perennial herb, enduring several years, but always perishes after flowering; stem 1.5–3 M. (5–10°) high, 2.5–12.5 Cm. (1–5′) thick, greenish, erect, furrowed, smooth; leaves few, radical and cauline, mostly near stem's base, .3–.6 M. (1–2°) long, same width, on stout, round petioles 22.5 Cm. (9′) long, expanding below into inflated sheath surrounding one-half the stem, compound, ternately divided, each bipinnate with few pinnæ, leaflets few; flowers small, monœcious, pale-yellow; root conical, 45 Cm. (18′) long, 10–15 Cm. (4–6′) thick, dark-brown, inside whitish. GUM-RESIN (asafetida), in irregular masses of whitish tears imbedded in a yellowish-brown sticky mass, fracture of tears conchoidal, white color, soon turning pink, then brown; odor alliaceous, persistent; taste bitter, acrid, alliaceous. The tears should alone be used in medicine. *Tests:* 1. When triturated with water yields a milky emulsion, turning yellow with alkalies. 2. Alcohol should dissolve at least 60 p. c. of it. 3. Hydrochloric acid should produce only slight effervescence with green coloration. 4. Ash should be not more than 10 p. c. *Solvent:* alcohol. Dose, gr. 5–15 (.3–1 Gm.).

ADULTERATIONS.—In its native country at Herat, previous to reaching Bombay, there is usually added red clay, sand, stones, wheat or barley flour, gypsum, calcium carbonate, calcium sulphate, cloth, bristles, wood, rosin, resins, translucent gums, in all amounting sometimes to 60–80 p. c.

Commercial.—Known in the East from early ages. In April when the leaves begin to wither collection is started by removing the soil around upper portion of the root 15 Cm. (6′) in depth and width, then pulling off the leafy stem; this laid bare portion is now covered with leaves and earth for 40 days, as a protection against the heat of the sun. These leaves are removed in late May and a slice of root cut off, whereupon juice slowly exudes, being scraped off on the third day, and put into leather (kid or goat) bags, then after the same interval another thin slice is taken off and juice collected, and then again another thin slice is taken off and juice collected, and then again another slice; these three cuttings constitute a process which can be repeated at ten-day intervals until the root is exhausted and perished (about two months), each succeeding process yields thicker and better juice; the root must all this while be screened from the sun. The juice from many plants is now mixed and hardened in the sun, each root yields ½–32 ozs. (.015–1 Kg.). It enters commerce via Bombay, in skins, mats (80–90 lbs.; 36–40.5 Kg.), boxes (200–400 lbs.; 91–182 Kg.), and casks. The purest is usually soft, called natively *hing*, and from its transparency is thought to be from the stem; this is used in India, while the mixed, called *hingra*, is alone exported. Asafetida can be powdered when excessively cold or after drying over unslaked lime for two weeks in a close vessel; it retains powdered-form best when kept in paper packages over lime. We have several commercial varieties:

FIG. 281.



Ferula fœtida.

1. *Amygdaloid.*—This, also called the *lump* variety, is the official kind, and considered to be the most reliable.

2. *Tears.*—This is inferior, consisting of various-sized tears (pea to a walnut), yellowish, roundish, flattened, oval, irregular-shaped, distinct or adhesive and agglutinated.

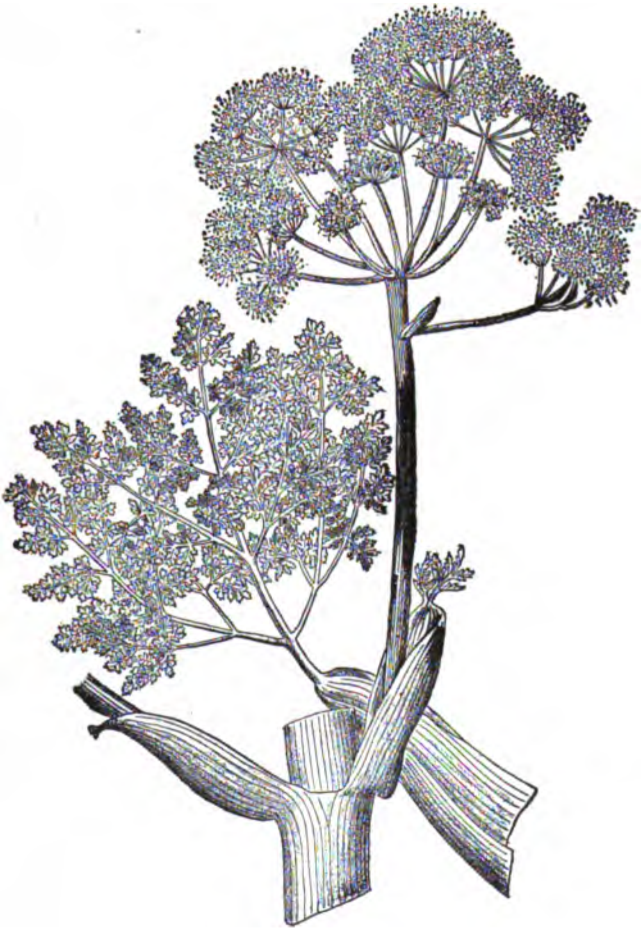
3. *Stony.*—Various-sized, angular or rounded pieces of gypsum and

other earthy matters, agglutinated or merely coated with the milky juice; this should not be used in medicine.

4. *Liquid.*—This is white, opaque, syrupy, or semifluid mass, by age turning brown; may be the first exudation, or due to moist season.

CONSTITUENTS.—Gum 20–30 p. c., Resin, 50–70 p. c., Volatile oil 3–9 p. c., vanillin .06 p. c., free ferulic (ferulaic) acid 1.3 p. c., ash 3–4 p. c.

FIG. 282.



Ferula galbaniflua.

Gum.—Partly soluble in water, the residue (bassorin) dissolves in alkalies, being reprecipitated by acids.

Resin.—Soluble in ether except 3–4 p. c. It is the ferulic acid ester of asaresino-tannol, and contains ferulic acid, $C_{10}H_{10}O_4$, and resino-tannol, $C_{24}H_{35}O_5$; upon dry distillation yields umbelliferon, $C_9H_6O_3$, and blue-colored oils; when fused with potassa gives resorcin and protocatechuic acid.

Volatile Oil.—To this the odor and stimulating property are due, and is obtained by distilling with water or alcohol, sp. gr. 0.980. It is a mixture of several sulphides of ferulyl—($C_7H_{14}S_2$ and $C_{11}H_{20}S_2$), two terpenes—($C_{10}H_{16}$ and $C_{10}H_{16}O$), the latter yielding a sesquiterpene, $C_{15}H_{24}$, and a blue-colored oil in the higher boiling portions.

Preparations.—1. *Emulsum Asafœtidæ.* Emulsion of Asafetida. (Syn., Mistura (Lac) Asafœtidæ, Milk of Asafœtida; Fr. Mixture (Lait) d'Asafœtida; Ger. Asafœtida-Emulsion, Stinkasant-milch.)

Manufacture: 4 p. c. Rub 4 Gm. in a warm mortar, gradually adding water q. s. 100 Cc.; strain. Dose, ʒss–1 (15–30 Cc.).

2. *Pilulæ Asafœtidæ.* Pills of Asafetida. (Syn., Fr. Pilules d'Asefétide; Ger. Asafœtida-Pillen.)

Manufacture: Asafetida 20 Gm., soap 6, water q. s. 100 pills. Dose, 2–5 pills.

3. *Tinctura Asafœtidæ.* Tincture of Asafetida. (Syn., Fr. Teinture d'Asefétide; Ger. Tinctura Asæ-fœtidæ, Stinkasant-tinktur.)

Manufacture: 20 p. c. Macerate 20 Gm. seven days in a closed-vessel with alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

4. *Pilulæ Aloes et Asafœtidæ.* Aloes 9 Gm., asafetida 9, soap 9, water q. s. 100 pills. Dose, 1–5 pills.

Unoff. Preps.: Dewees' Carminative. Dose, ʒss–4 (2–15 Cc.). *Pil. Galbani Comp.* Dose, 2–4 pills. *Ammoniated Spirit.* Dose, ʒss–1 (2–4 Cc.). *Plaster, Suppositories, Enema* (1 to 64 water).

Properties.—Similar to other drugs with volatile oils; stimulant, antispasmodic, expectorant, laxative (emmenagogue, anthelmintic, condiment).

Uses.—Hysteria, hypochondriasis, convulsions, spasms, whooping-cough, measles, asthma, coughs, catarrhs, flatulent constipation, chorea, nervous apoplexy, consumption. Used in India, Persia, etc., as a condiment, for flavoring food, etc., like garlic and onions. Acts here as a stimulant to the bowels and digestion. The natives worship it not only for its agreeable effect, but for the odor and taste, the latter being acquired by usage, because at first it is often nauseous and positively disgusting.

Incompatibles: Cerebral and arterial depressants, cold, acids, neutral salts; water with alcoholic liquid preparations.

Synergists: Cerebral excitants, alcohol, ether, gum-resins, balsams, aromatics, volatile oils containing sulphur and phosphorus.

Allied Plants:

1. *Ferula Na'rthex* (*Narthex assafœ'tida*).—Official, 1820–1890. This plant is almost identical with *F. fœtida,* and from it much gum-resin is collected and sent in with the official. It is almost impossible to recognize plant origin by the product.

2. *Ferula galbani'flua, Galbanum.*—Gum-resin official, 1820–1890, N. Persia. Plant 1.3–1.6 M. (4–5°) high, 2.5 Cm. (1′) thick, solid,

striate leaves radical and cauline; flowers yellow; fruit 12 Mm. (½′) long, winged near face of mericarps. Gum-resin in tears size of pinhead to that of a pea, brownish-yellow, inside milk-white, waxy, odor peculiar, balsamic, taste bitter, acrid, with water gives milky emulsion. Obtained from incisions; contains gum 15–20 p. c., resin 60–66 p. c., volatile oil 6–9 p. c., umbelliferon. Used as stimulant, expectorant, antispasmodic, for hysteria, chlorosis, catarrh, amenorrhœa, rheumatism, bronchitis, for church incense, tumors, boils, in pill, emulsion, tincture, plasters. Dose, gr. 5–20 (.3–1.3 Gm.). It is intermediate between asafetida and ammoniac.

SUMBUL. SUMBUL.

Ferula Sumbul, *Hooker filius.* } The root.

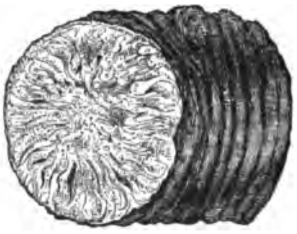
Habitat. C. and N. Asia (Turkestan, Bucharia, E. Siberia, Russia).

Syn. Musk Root; Br. Sumbul Radix; Fr. Racine de Sumbul; Ger. Sumbulwurzel, Moschuswurzel.

Sum′bul. L. fr. Ar. Pers. Hind. *sumbul*, spikenard—their native name, *sumboul*, a spike; *i. e.*, the appearance of the flowering stem.

Plant.—Perennial herb dying after flowering; stem erect, 2–3 M. (6–10°) high, 4 Cm. (1½′) thick at base, solid, glabrous, purplish, exuding milky juice when injured; with 12 stiff, slender, divaricate branches in the upper half; leaves—radical .8 M. (2½°) long, with surrounding petioles, outline triangular, tripinnate, leaflets ovate, deeply divided into wedge-shaped segments, dentate, bright-green—cauline few, smaller near base; flowers polygamous, umbels 10–15-rayed; fruit 12 Mm. (½′) long, 6 Mm. (¼′) wide, mericarps oblong-oval, compressed, thin, 3 faint dorsal ridges. Root, large, 10–12.5 Cm. (4–5′) thick, 30–37.5 Cm. (12–15′) long, fusiform, usually occurs in transverse segments 2.5–7.5 Cm. (1–3′) in diameter, 2.5–5 Cm. (1–2′) in length, light, spongy, annulate or longitudinally wrinkled, bark thin, brown, bristly, fibrous, interior whitish with many brownish-yellow resin-dots, and irregular, easily separated fibres.; odor strong, musk-like, taste bitter, balsamic. *Solvent:* alcohol 65 p. c. Dose, gr. 10–30 (.6–2 Gm.).

Fig. 283.



Sumbul root, section.

Commercial.—Plant was discovered in 1869 on the boundary between Russian Turkestan and Bucharia, at an elevation of 900–1,200 M. (3,000–4,000°); it has been used natively a long time as perfume, incense and medicine. We have two varieties: 1. *Russian*, comes to us via St. Petersburg, and is the only kind used in this country. 2. *Indian*, enters market via Bombay, is of closer texture, firmer, denser, and of a reddish tint.

Constituents.—Volatile oil (bluish, peppermint-taste), ⅓–1 p. c., Resin (soft, musk-odor), 9 p. c., fixed oil 17 p. c., angelic acid (sumbulic acid), $C_5H_8O_2$, valerianic acid, $C_5H_{10}O_2$, methylcrotonic acid, bitter extractive, sugar, starch. Dry distillation gives bluish volatile oil, containing umbelliferon.

PREPARATIONS.—1. *Tinctura Sumbul.* Tincture of Sumbul. (Syn., Fr. Teinture de Sumbul; Ger. Moschuswurzel or Sumbul-tinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ♏x–30 (.6–2 Cc.). *Extract.* Dose, gr. 2–5 (.13–.3 Gm.). *Resin.* Dose, gr. 1–2 (.06–.13 Gm.).

PROPERTIES.—Stimulant, carminative, tonic, nervine (resembles musk and valerian), antispasmodic.

USES.—Hysteria, female nervousness, epilepsy, chlorosis, amenorrhœa, asthma, delirium tremens, bronchitis, leucorrhœa, gleet, typhoid, atonic dysentery, hypochondriasis. Often combined in nervous troubles with asafetida, and in chlorosis with iron, arsenic, etc.

Incompatibles and *Synergists:* Same as for asafetida; all preparations immiscible with water.

Allied Plant:

1. *Dore′ma Ammoni′acum, False Sumbul of India.*—Claimed by some to be the true source of Indian Sumbul, but *Dorema* has no musk-like odor, and is more yellow.

AMMONIACUM. AMMONIAC.

Dorema Ammoniacum, *Don.* } The gum-resin.

Habitat. E. Persia, Turkestan. (On silicious soil, in deserts, barren regions.)

Syn. Gummi-resina Ammoniacum. Fr. Ammoniaque, Gomme-résine ammoniaque. Ger. Ammoniacum, Ammoniakgummi.

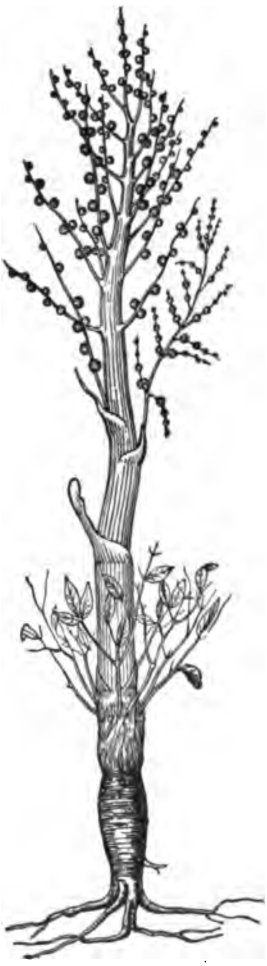
Do-re′ma. L. fr. Gr. *δώρημα*, a gift, benefit; *i. e.*, its yielded product is a benefit.

Am-mo-ni′a-cum. L. *ammoniacus*, Gr. *ἀμμωνιακόν* (Dioscorides), salt of Ammonia, from its being prepared out of camels' dung near the Temple of Jupiter Ammon, Libyan Desert, Africa, so likewise this gum-resin named, because it was said to be originally obtained (distilled) from a tree or plant near this temple.

PLANT.—Striking appearance, dying after flowering; stem 1.6–2 M. (5–7°) high, 2.5 Cm. (1′) thick at base, pale-green with greenish-purple joints, hollow, dividing at apex into about 16 branches bearing the white flowers; leaves—radical few (4), sheathing, large, .5–.6 M. (1½–2°) long, bi- or tripinnate, densely covered with white down—cauline 3–4, reduced to large, pale sheaths, long, reflexed; flowers very small, sessile, immersed in dense white cottony-wool, umbels (heads) many, 12 Mm. (½′) in diameter; grows alongside of the asafetida plants. GUM-RESIN (ammoniac), in roundish tears 1.5–6 Mm. ($\frac{1}{16}$–¼′) thick, distinct or agglutinated, yellowish, fracture conchoidal, waxy, milky-white; odor peculiar; taste acrid, bitter, nauseous; with water gives milky emulsion. *Test:* Alcohol to moisten + hydrochloric acid gives no color change. *Solvent:* Alcohol. Dose, gr. 10–30 (.6–2 Gm.).

Commercial.—The entire plant in spring (May) abounds with milky juice which rapidly flows out from even every puncture and sting made by animal or insect. Beetles in quest of food make most of these on the stem, while the root is fissured in many places by changes of temperature, this latter for the first five years furnishes in a decreasing ratio all of the juice; by this time the stem is matured for the best yield, after which the plant soon dies. The juice quickly congeals, and either adheres or falls to the ground, when in July it is collected. In order to powder should make it very cold or dry it over lime. We have several varieties: 1. *Ammoniac in tears*, as above described. 2. *Ammoniac in cakes*, which is from the root in agglutinated brown resinous masses containing plant fragments, fruits, sand, and tears well incorporated. At Bombay, its chief entrepôt, these are garbled, classified into various grades for different markets and sewed up in coarse canvas bales.

FIG. 284.



Dorema Ammoniacum.

CONSTITUENTS.—Gum 18–28 p. c., Resin 70 p. c., Volatile oil 1–4 p. c., moisture 5 p. c., ash 1–3 p. c.

Gum. — This is acid calcium arabinate, contains calcium oxide and closely resembles acacia, being soluble in water or alkalies.

Resin.—This consists of an acid and an indifferent (neutral) resin, the one soluble, the other insoluble in ether, this latter, however, being readily dissolved by alcohol, volatile and fixed oils. By saponification the acid-resin yields salicylic acid and ammoresino-tannol, $C_6H_{10}O$, also valerianic and butyric acids. By dry distillation the resin yields no umbelliferon, but fused with potassa gives protocatechuic acid and resorcin, $C_6H_6O_2$, which is soluble in simple solvents, volatile, inflammable, reddened on exposure, and purplish-black with ferric chloride. The volatile oil contains neither sulphur nor phosphorus.

PREPARATIONS.—1. *Emulsum Ammoniaci.* Emulsion of Ammoniac. (Syn., Mistura (Lac) Ammoniaci, Ammoniac Mixture, Milk of Ammoniac; Fr. Mixture (Emulsion) de Gomme ammoniaque, Lait ammoniacal; Ger. Ammoniak-Emulsion.)

Manufacture: 4 p. c. Rub 4 Gm. in a warm mortar, gradually adding water q. s. 100 Cc., strain. Dose, ℥ss–1 (15–30 Cc.).

2. *Emplastrum Ammoniaci cum Hydrargyro.* Ammoniac Plaster with Mercury. (Syn., Fr. Emplâtre de Gomme Ammoniaque mercuriel; Ger. Quecksilber und Ammoniak-Pflaster.)

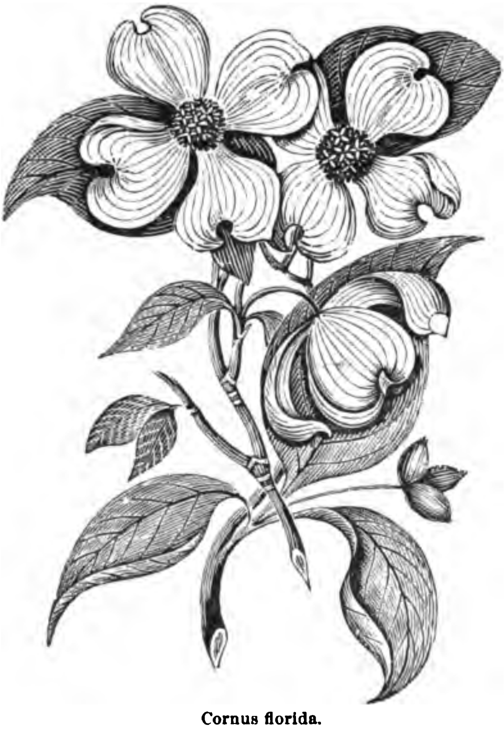
Manufacture: 72 p. c. Digest 72 Gm. with diluted acetic acid 100 Cc., strain, evaporate; triturate mercury 18 Gm. with oleate of mercury .8 Gm. to which add ammoniac and then lead plaster q. s. 100 Gm.

Unoff. Preps.: Pills. Powders. Plasters.

PROPERTIES.—Stimulant, expectorant, rubefacient, acts on circulation and nutrition. Large doses cause skin eruptions, vomiting, colic, diarrhœa (volatile oil and resin). Action similar but less powerful than asafetida.

USES.—Bronchitis, chronic catarrh, asthma, pleurisy; externally as a resolvent in white swelling, indolent tumors, glandular enlargements.

FIG. 285.



Cornus florida.

Allied Plants:

1. *Dorema Au'cheri.*—W. Persia. Yields a similar product, (ammoniac), while *Dorema robu'stum* gives a dissimilar gum-resin.

2. *Fe'rula tingita'na, African Ammoniac.*—This is thought to be the "ammoniacum" of the ancients, it is darker than the official, odor agreeable, like benzoin, taste acrid, bitter. Contains gum 9 p. c., resin 68 p. c., and yields umbelliferon.

3. *Opo'panax Opopanax (Chiro'nium).*—S. Europe. Root and stem exude yellowish milk, hardening into reddish-brown tears, having a waxy lustre, and a bitter, balsamic taste.

4. *Cor'nus flo'rida, Flowering Dogwood.* —Cornaceæ. The bark of root official, 1830 1890. N. America. Small tree 4.5–10.5 M. (15–35°) high, 12.5–25 Cm. (5–10′) thick, flowers greenish with 4 large white involucral leaves, petaloid; fruit bright-red. Bark deprived of the furrowed brown-gray outside corky layer, in curved pieces 3 Mm. (⅛′) thick, reddish-brown color, striate, astringent, bitter; contains cornin (cornic acid), tannin 3 p. c., resin; used as astringent, tonic, febrifuge, stimulant, as substitute for cinchona, when fresh emetic; in decoction, fluid extract. Dose, gr. 15–60 (1–4 Gm.).

5. *Cor'nus circina'ta, Round-leaved Dogwood.*—The bark official, 1820–1880, N. America. Shrub 1.6–3 M. (5–10°) high, branches

greenish, warty; leaves round, 10–12.5 Cm. (4–5′) wide, woolly beneath; flowers white cymes; fruit, blue drupe. Bark quilled, curved, greenish, brownish-gray, with suberous warts or longitudinal lines, inside cinnamon-brown. Used as the *C. florida,* but is more bitter and less astringent.

6. *Cor′nus Amo′num (se′ricea), Silky Cornel, Swamp Dogwood.*—The bark official, 1820–1880. N. America. Shrub 1.6–3 M. (5–10°) high, branches purple; leaves elliptical, silky beneath; flowers yellowish, woolly cymes; fruit pale-blue. Bark quilled, thin, outside purplish-brown, less warty than preceding, otherwise resembling. Used like *C. florida,* but is less bitter and astringent.

SERIES 2: GAMOPETALÆ. Petals more or less united, rarely separate or wanting.

65. PYROLACEÆ. Wintergreen Family.

Pir-o-la′se-e. L. *Pyrol-a* + aceæ, dim. of *pirus* (*pyrus*), a pear-tree, fr. Celtic, *peren,* pear. Low, mostly evergreen perennials. Distinguished by leaves petiolate; flowers perfect, white or pink, calyx 4–5-lobed, corolla deeply 4–5-parted or 5 petals, stamens 8–10; ovary 4–5-celled, superior, stigma 5-lobed; fruit capsule, dehiscent; temperate climates; diuretic, nephritic, astringent, tonic.

Genus: 1. **Chimaphila.**

CHIMAPHILA. CHIMAPHILA (PIPSISSEWA).

Chimaphila umbellata, (*Linné*) *Nuttall.* } The leaves.

Habitat. N. America, N. Asia, N. and C. Europe, in dry woods.

Syn. Prince's Pine, Rheumatism Weed, King's Cure, Wintergreen, Bitter Wintergreen, Ground Holly, Noble Pine, Pyrola, Pine Tulip. Fr. Herbe de Pyrole ombellée. Ger. Doldenblüthiges Harnkraut, Wintergrün.

Chi-maph′i-la. L. fr. Gr. χεῖμα, winter, + φίλος, loving; *i. e.,* remains green all winter, as though loving that season.

Um-bel-la′ta. L. *umbellatus,* umbellated; *i. e.,* flowers in corymbose umbels.

Pip-sis′se-wa. American Indian name.

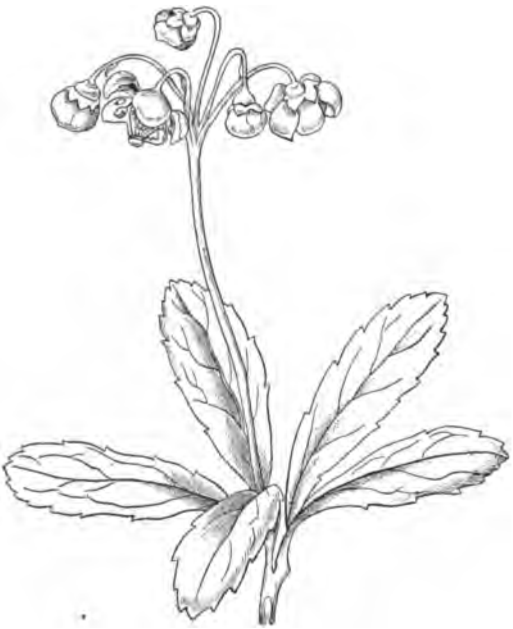
PLANT.—This is also known as *Chimaphila corymbo′sa* and *Py′rola umbella′ta;* it is a perennial, 10–25 Cm. (4–10′) high, with the leaves near stem's apex; rhizome yellowish, creeping; flowers June–July, white, tinged with red, exhaling perfume, terminal corymb or umbel. LEAVES, oblanceolate, 5 Cm. (2′) long, sharply serrate above, wedge-shaped and nearly entire towards the base, coriaceous, smooth, dark-green above; inodorous; taste astringent, bitter. *Solvents:* diluted alcohol; boiling water. Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Chimaphilin, $C_{24}H_{21}O_4$, arbutin, ericolin, urson, tannin 4 p. c., resin, sugar, gum, ash 5 p. c.

Chimaphilin.—Neutral principle obtained by distilling with water, when its yellow crystals deposit in neck of retort, or can shake diluted alcoholic tincture with water or chloroform, thus dissolving it out; it is inodorous, tasteless, soluble in alcohol, ether, chloroform, slightly in water; gives red with sulphuric acid. The "Eclectic" resinoid, *chimaphilin*, is a dark-brown bitter powder. Dose, gr. 2–3 (.13–.2 Gm.).

PREPARATIONS.—1. *Extractum Chimaphilæ Fluidum.* Fluid Extract of Chimaphila. (Syn., Fr. Extrait liquide de Pyrole ombellée; Ger. Flüssiges Doldenblüthiges Harnkraut-Extrakt.)

FIG. 286.



Chimaphila umbellata; upper part of flowering stem.

Manufacture: Macerate, percolate 100 Gm., with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 3–10 (.2–.6 Gm.). *Decoction*, 5 p. c. Dose, ℥j–3 (30–90 Cc.). *Poultice.*

PROPERTIES.—Astringent, tonic, diuretic, nephritic; locally rubefacient. About the same as buchu, uva-ursi, pareira, scoparius.

USES.—Scrofula, rheumatism, dropsy, scanty urine, gravel, hæmaturia, gonorrhœa, skin and kidney troubles, diarrhœa, gout; checks uric acid secretion; externally to ulcers, tumors.

Allied Plants:

1. *C. macula'ta, Spotted Wintergreen* (*Pipsissewa*).—The leaves official, 1830–1840. N. America. Herb, 7.5–15 Cm. (3–6′) high, leaves 2.5–5 Cm. (1–2′) long, 12 Mm. (½′) wide, ovate-lanceolate, obtuse at base, toothed, upper surface variegated (spotted) with white along midrib and veins; flowers purplish-white.

2. *Py'rola rotundifo'lia, Round-leaved Wintergreen; P. elli'ptica, Shin-leaf*, and *P. chlora'ntha, Greenish-flowered Wintergreen.*—These three have racemes of nodding wax-like flowers; leaves resembling and containing same as the official, hence used similarly.

66. ERICACEÆ. Heath Family.

Er-i-ka'se-e. L. *Eric-a* + aceæ, Gr. ἐρείκη, heath, fr. ἐρείκω, to break; *i. e.*, because some species break stone in the bladder. Shrubs or small trees. Distinguished by astringent properties; leaves evergreen, exstipulate; calyx 4–5-cleft, inferior, corolla, regular, hypogynous, 4–5-cleft; stamens as many or twice corolla-lobes, free from but inserted with it; anthers 2-celled; ovary 2–5-celled, style 1; fruit, capsule or berry, edible; universal; astringent, tonic, diuretic, narcotic, poisonous.

Genera: 1. **Gaultheria.** 2. **Arctostaphylos.**

GAULTHERIA. GAULTHERIA (WINTERGREEN).

Oleum Gaultheriæ. Oil of Gaultheria (Oil of Wintergreen), *official.*

Gaultheria procumbens, *Linné.* } A volatile oil, distilled from the leaves. Consisting mostly of methyl salicylate, $CH_3C_7H_5O_3$, and nearly identical with volatile oil of Betula.

Habitat. N. America, Canada, Georgia, Minnesota, in cold, damp woods, mostly in the shade of evergreens.

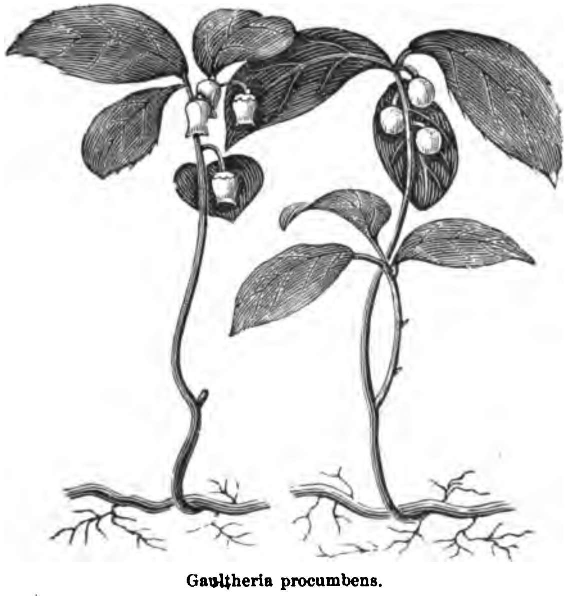
Syn. Spring-, Creeping-, Spicy or Aromatic Wintergreen; Checker-, Partridge-, Box-, Spice-, Deer-, Tea-, Ground-, Grouse-, Red or Hill-berry, Wax Cluster, Mountain Tea, Chinks, Red Pollom, Ivory Plum, Oil of Teaberry or Partridgeberry. Fr. Feuilles de Gaulthérie (de Palommier), Thé (du Canada) de Terre-neuve, Essence de Gaulthérie. Ger. Canadischer Thee, Bergthee, Bergtheeöl.

Gaul-the′ri-a. L. dedicated by Kalm to Dr. Gaulther, of Quebec.

Pro-cum′bens. L. *pro*, forward, + *cumbere*, to lie, lying down; *i. e.*, the stem.

PLANT.—Stem creeping on or below the surface, branches ascending; leaves alternate, evergreen, spicy, obovate, mucronate, serrate, crowded at top of the stem; flowers June–Sept., few, white, on stem 7.5–12.5 Cm. (3–5′) high; fruit bright-red berries or capsules, 5-celled, spicy, aromatic.

FIG. 287.



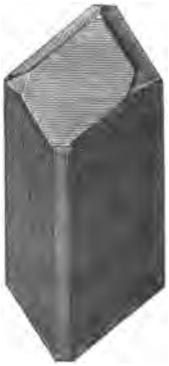
Gaultheria procumbens.

CONSTITUENTS.—Volatile oil 0.5 p. c. (salicylic acid, methyl salicylate), arbutin, ericolin, urson, resins, tannin 6 p. c., ash 4–5 p. c.

Oleum Gaultheriæ. Oil of Gaultheria.—This is a yellowish or reddish liquid; characteristic aromatic odor; sweet, warm, aromatic taste; sp. gr. 1.180; consists of methyl salicylate, $CH_3C_7H_5O_3$, 99 p. c., also a paraffin (triacontan), $C_{30}H_{62}$, an aldehyde or ketone, an apparently secondary alcohol, $C_8H_{16}O$, and an ester, $C_{14}H_{24}O_2$; it is soluble in alcohol, giving with ferric chloride in alcoholic solution dark-purple; with nitric acid forms colorless prisms. *Tests:* 1. Heated to 80° C. (176° F.) should not give colorless distillate (abs. alcohol, chloroform). 2. Equal quantity nitric acid should not give deep-red color or dark-red resinous mass (abs. oil of sassafras). 3. Sulphuric acid increases temperature, owing to terpene present (not so with artificial oil). Should be kept dark, in well-stoppered bottles. Dose, ♏j–10 (.06–.6 Cc.).

ADULTERATIONS.—Oils of sassafras and betula, alcohol, chloroform, etc.

FIG. 288.



Salicylic acid crystal.

Acidum Salicylicum. Salicylic Acid, $HC_7H_5O_3$, *official.*—(Syn., Ortho-oxybenzoic Acid; Fr. Acide salicylique; Ger. Salicylsäure.) This organic acid exists naturally in combination in various plants, (gaultheria, betula, etc.) and may be obtained by fusing salicin with potassa, or by heating (saponification) oil of gaultheria with potassa until all of the methylic alcohol is given off, then decomposing the potassium salicylate with hydrochloric acid, but it is prepared synthetically on a much larger scale, from carbolic acid, by passing CO_2 gas through sodium carbolate heated to 220° C. (428° F.); the sodium salt is now dissolved in water, decomposed by HCl, the sodium chloride solution filtered off, the salicylic acid crystals washed, dissolved in boiling water and then allowed to recrystallize. $2NaC_6H_5O + CO_2 = Na_2C_7H_4O_3$ (sodium salicylate) + C_6H_6O (phenol); $Na_2C_7H_4O_3 + 2HCl = HC_7H_5O_3 + 2NaCl$. It is in light, fine, white, crystalline needles or powder; odorless; sweetish, then acrid taste; permanent; soluble in alcohol, ether, 450 parts water; melts at 157° C. (314.6° F.); 138 grains salicylic acid correspond to 169 grains oil of gaultheria. *Tests:* 1. Aqueous or alcoholic solution turns bluish-violet with ferric chloride T. S. 2. Saturated alcoholic solution upon spontaneous evaporation should leave white crystalline residue (abs. iron, carbolic acid, etc.). Dose, gr. 5–30 (.3–2 Gm.).

Impurities.—Iron, carbolic acid, coloring and carbonizable organic matters, creosote, hydrochloric acid.

Methyl Salicylas. Methyl Salicylate, $CH_3C_7H_5O_3$, *official.*—(Syn., Artificial (Synthetic) Oil of Wintergreen; Ger. Künstliches Wintergrünöl.) This is produced synthetically by distilling salicylic acid or a salicylate with methyl alcohol and sulphuric acid. It is a colorless or yellowish liquid, aromatic odor, sweet, warm, aromatic taste of oil of gaultheria, having its essential constituent as also that of oleum betulæ volatile; sp. gr. 1.185, boils at 220° C. (428° F.); soluble in alcohol, glacial acetic acid. *Tests:* 1. The precipitate by shaking with soda should dissolve when allowed to stand in boiling water, giving faint-yellow solution, without any oily drops separating (abs. petroleum, volatile oils). 2. Alkaline solution + hydrochloric acid should give pure salicylic acid (abs. methyl benzoate). Dose, ♏j–10 (.06–.6 Cc.).

Impurities.—Alcohol, chloroform, volatile oils, petroleum, methyl benzoate.

PREPARATIONS.—OIL: 1. *Spiritus Gaultheriæ.* Spirit of Gaultheria. (Syn., Fr. Alcoolat (Esprit) de Gaulthérie; Ger. Bergtheespiritus (geist).)

Manufacture: Dissolve oil 5 Cc. in alcohol 95 Cc. Dose, ʒj–2 (4–8 Cc.).

2. *Syrupus Sarsaparillæ Compositus,* $\frac{1}{100}$ p. c. Dose, ʒj–4 (4–15 Cc.).

3. *Trochisci Morphinæ et Ipecacuanhæ,* ♏$\frac{1}{33}$ (.002 Cc.) in each. Dose, 1–3 troches.

PROPERTIES.—Antiseptic, antipyretic, antiperiodic, stimulant, diuretic, cardiac depressant. Small doses stimulate the stomach, heart, respiration; large doses derange stomach, causing nausea, vomiting, reduce respiration, heart action, temperature and arterial tension. By gastro-intestinal secretions converted into sodium salicylate, and as such enters circulation; it is eliminated by kidneys and skin mainly as salicyluric acid.

USES.—Rheumatic fever, migraine, sciatica, diabetes, cystitis, diphtheria; externally, warts, corns, excess of epidermis.

Salicylism is the result of extravagant doses of salicylates, and resembles *cinchonism* from quinine. It consists of headache, deafness, ringing in the ears, sweating, weak pulse and respiration, nausea, delirium, vomiting, etc., and can be prevented by preceding each dose with a small quantity of alcoholic stimulant. *Leaves* of gaultheria official, 1820–1890.

Poisoning: Diffusible stimulants, atropine, strychnine. Same as for acetanilid.

Incompatibles: Arterial and cerebral stimulants: alkalies, mineral acids, metallic salts (especially ferric), spirit of nitrous ether.

Synergists: Carbolic acid derivatives, anæsthetics, cardiac and cerebral depressants.

UVA-URSI. UVA-URSI (BEARBERRY).

Arctostaphylos
Uva-Ursi, (*Linné*) *Sprengel.* } The leaves.

Habitat. Europe, Asia, N. America, in mountains, on dry and rocky soil, United States, south to New Jersey, thence westward to California, New Mexico.

Syn. Upland, Mountain or Wild Cranberry, Universe Vine, Mountain Box, Bear's-Grape, -Bilberry or Whortleberry, Barren Myrtle, Kinni-Kinnick, Fox or Mealberry, Rapper Dandies (the fruit), Sagackhomi. Fr. Busserole, Raisin d'Ours. Ger. Uvæ Ursi Folia, Bärentraubenblätter.

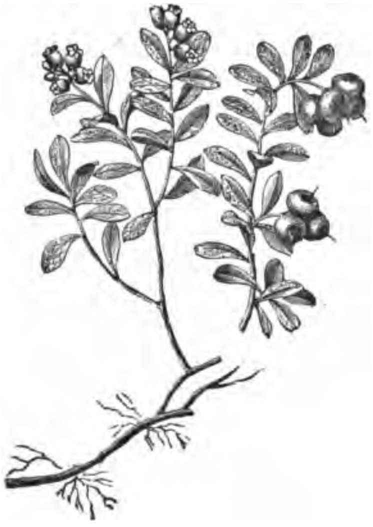
Arc-to-staph′y-los. L. fr. Gr. ἀρκτος, a bear, + σταφυλή, a bunch of grapes; *i. e.*, the roughness of the fruit and these berries occurring in clusters like grapes.

U′va-Ur′si. L. *uva*, a grape, + *ursus*, *ursi*, a bear, of a bear—bear-berry; *i. e.*, berries are rough or bearish.

PLANT.—Low evergreen shrub; stem trailing, young branches rising obliquely upward several inches; flowers May, 3–15 together, pinkish-white, racemes, calyx reddish, corolla urceolate, reddish-white or white with red lips; fruit autumn, 6 Mm. ($\frac{1}{4}'$) broad, fleshy, bright-red berry, skin thick, 5-seeded, resembles currants in appearance and clusters. LEAVES, 15–20 Mm. ($\frac{3}{5}$–$\frac{4}{5}'$) long, 5–8 Mm. ($\frac{1}{5}$–$\frac{1}{3}'$) broad, short-stalked, obovate, coriaceous, obtuse, margin revolute, upper surface with depressed veins, lower surface distinctly reticulate; odor faint, hay-like; taste astringent, bitter; collect in autumn. *Solvents:* diluted alcohol; boiling water. Dose, gr. 15–60 (1–4 Cc.).

ADULTERATIONS.—1. *Vacci′nium Vi′tis-Idæ′a*, *Wind* or *Cowberry*, *Red Whortleberry*, and *V. uligino′sum*, *Bog Whortleberry*, *Great Bilberry*. Leaves resemble uva-ursi, but margins crenate, under surface bristly, pubescent.

FIG. 289.



Arctostaphylos Uva-Ursi.

2. *De′ndrium* (*Leiophy′llum*) *buxifo′lium*, *Sand Myrtle*.—N. J., southward. Small shrub; leaves oval, shining, margin revolute, reticulate.

3. *Bu′xus sempe′rvirens*, *Box*, *Bush-tree Dudgeon*.—Cultivated in our gardens; leaves ovate, narrower toward apex than near the base; contain buxine and parabuxine (both giving bitterness), tannin, volatile oil, bitter extractive.

4. *Epigæ′a re′pens*, *Trailing Arbutus* (*Mayflower*, *Ground Laurel*, *Gravel Plant*) and *Chimaphila umbellata*, *Pipsissewa*.—Leaves resemble and both contain the three active constituents of uva-ursi. Used in lithic acid gravel. Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Arbutin, $C_{12}H_{16}O_7$, Ericolin, $C_{34}H_{56}O_{22}$, Urson, $C_{10}H_{16}O$, Tannin 6–7 p. c., gallic acid, ellagic acid, coloring matter, ash 3 p. c.

Arbutin.—A glucoside obtained by precipitating the decoction with lead subacetate, treating filtrate with hydrogen sulphide, and evaporating to crystallize. It is in needles, bitter, soluble in alcohol or hot water, insoluble in ether, blue with diluted ferric chloride; with sulphuric acid yields glucose, arctuvin (hydroquinone), $C_6H_6O_2$, and methyl-hydroquinone, $C_7H_8O_2$. Dose, gr. 3–5 (.2–.3 Gm.).

Ericolin.—This is left in the mother-liquor from arbutin; it is a bitter glucoside, yellow, soluble in water, alcohol; yields glucose and ericinol (volatile oil).

Urson.—Crystalline principle, resinous, obtained by exhausting with ether, evaporating, re-crystallizing from alcohol; occurs in tasteless needles, insoluble in water, sparingly in alcohol, ether.

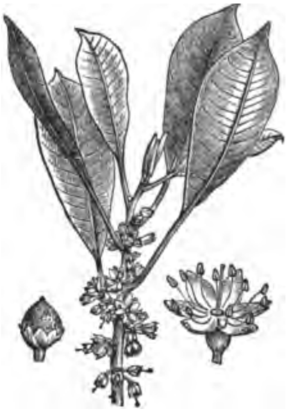
PREPARATIONS.—1. *Extractum Uvæ-Ursi.* Extract of Uva-Ursi. (Syn., Fr. Extrait de Busserole; Ger. Bärentraubenblätter-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 30 p. c., q. s. Dose, gr. 5–15 (.3–1 Gm.).

2. *Extractum Uvæ-Ursi Fluidum.* Fluid Extract of Uva-Ursi. (Syn., Fr. Extrait liquide de Busserole; Ger. Flüssiges Bärentraubenblätter-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 30 Cc., alcohol 20, water 50, finishing with alcohol 30 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

FIG. 290.



Palaquium Gutta.

Unoff. Preps.: Infusion. Dose, ℥j–2 (30–60 Cc.). *Decoction.* Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Astringent, diuretic, tonic, nephritic, disinfectant (due to the hydroquinone formed). Large dose vomits, purges, oxytocic.

USES.—Cystitis, gravel, chronic nephritis, urethritis, incontinence of urine, dysuria, strangury, uterine hemorrhage, gleet, leucorrhœa, menorrhagia, urinary calculi, bronchitis, diarrhœa, cardiac dropsy.

Allied Plants:

1. *A. glau'ca, Manzanita.*—Cal. mountains, small tree; leaves 5 Cm. (2′) long; contains arbutin, tannin 10 p. c., ash 6 p. c. *A. polifo'lia,* and *A. mucroci'fera.* Mexico. Both used like uva-ursi.

2. *Kalmia latifo'lia, Mountain Laurel, Calico-bush.*—1.8–9 M. (6–30°) high; flowers inodorous, May–June; leaves evergreen, elliptical; contain tannin, arbutin, resin, andromedotoxin, $C_{31}H_{51}O_{10}$; astringent. Large doses poisonous.

3. *Limo'nium carolinia'num* (*Sta'tice Limo'nium* var. *carolinia'na*), *Marsh Rosemary.*—Plumbaginaceæ. The root official, 1820–1880. N. America. Plant a maritime perennial, acaulescent; leaves 2.5–4 Cm. (1–1½′) long, obovate, cuniform, entire, mucronate, scape .3–.6 M. (1–2°) high, terete, corymbose panicles; flowers lavender-color; root .3–.6 M. (1–2°) long, 2.5 Cm. (1′) thick, annulate, wrinkled, purplish-brown, astringent, bitter; contains tannin 14–18 p. c., volatile oil, resin. Used as astringent like catechu or kino for aphthous and ulcerated affections of the mouth, fauces, hemorrhages, dysentery; in infusion, decoction, tincture. Dose, gr. 5–30 (.3–2 Gm.).

4. *Pala'quium Gut'ta,* and *P. oblongifo'lium, Gutta-Percha.*—Sapotaceæ. Concrete exudation official, 1880–1890. Malayan Peninsula

and Islands, Singapore, Borneo. Tree, 18–21 M. (60–70°) high, .6–1 M. (2–3°) thick; bark reddish-gray; leaves 10–12.5 Cm. (4–5′) long, tomentose, silky beneath; flowers yellowish. Gutta-percha is obtained by incisions, or by felling trees, removing bark, and catching juice in plantain-leaf stalks, palm leaves, or cocoanut shells; it soon coagulates and occurs in yellowish, grayish masses, hard, heavier than water, flexible, plastic at 50° C. (122° F.), decomposes on melting; inodorous; tasteless; soluble in ether, chloroform, oil of turpentine, carbon disulphide. Contains gutta, $C_{20}H_{32}$, 80 p. c., fine, white powder; fluavil, $C_{20}H_{32}O$, yellow resin; albane, $C_{20}H_{32}O_2$, white resin. Used in surgery for splints, catheters, bougies, specula, pessaries, syringes, etc. *Liquor Gutta-Perchæ* official, 1880–1890, = 9 p. c. solution in chloroform. Used as an adhesive and protective agent for wounds, abrasions, skin troubles, sore nipples, erysipelas, small-pox, etc.

4. *Diospy′ros virginia′na, Persimmon.*—Ebenaceæ. The unripe fruit dried, official, 1820–1880. United States. Tree, 6–21 M. (20–70°) high, much smaller northward; wood hard, blackish; leaves 7.5–12.5 Cm. (3–5′) long, entire, glaucous beneath, elliptical; flowers yellowish; fruit plum-like, 2.5 Cm. (1′) thick, green, 4-lobed calyx at base; short style at apex, 6-celled, 6-seeded; taste astringent, when ripe orange-red, by frost sweet, edible. Contains tannin, malic acid. Used as astringent for diarrhœa, chronic dysentery, uterine hemorrhage, leucorrhœa, sore throat; in infusion, tincture, syrup. Dose, gr. 15–60 (1–4 Gm.). Persimmon beer made by fermenting ripe fruit with hops, as a beverage, and the bark as tonic and astringent are popular to some extent.

67. STYRACACEÆ. Storax Family.

Sti-ra-ka′se-e. L. *Styr-ax*(*ac*) + aceæ, Gr. *στύραξ*, a tree yielding gum, an alteration of native Ar. name *Assthirak*. Trees, shrubs. Distinguished by yielding stimulant balsamic resins; calyx 4–8-cleft, inferior; corolla 4–8-lobed; stamens equal or twice the petals, united at base; ovary 2–5-celled, each 1-seeded, style 1; fruit, berry or drupe, fleshy; tropics, temperate climates; stimulant; resins, dyes.

Genus: 1. **Styrax.**

BENZOINUM. BENZOIN.

Styrax Benzoin, *Dryander.* } A balsamic resin.

Habitat. Sumatra, Java, Borneo, Malay Peninsula, Laos, Siam.

Syn. Benzoin Laurel, Benjamin Tree, Resina Benzœ, Asa Dulcis, Gum Benjamin. Fr. Benjoin. Ger. Benzoë, Benzoe.

Sty′rax. L. see etymology, above, of Styracaceæ.

Ben-zo-i′num. L. fr. Ar. *luban*, *jawa*, = *lu* + *ban* + *join*, contracted, lit., "incense of Java," in universal use.

Ben-zo′in. The original word and mostly used.

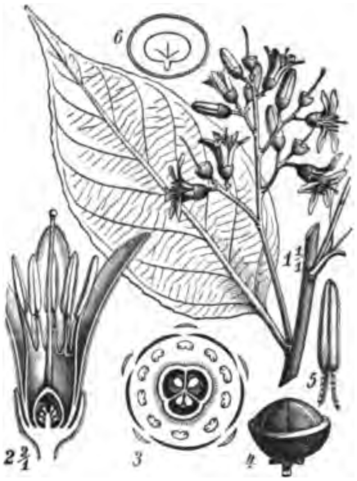
Plant.—Handsome tree, medium height, with dense spreading crown; bark grayish, tomentose; leaves oblong, downy, 7.5–12.5

Cm. (3–5′) long, acuminate, dentate; flowers inside reddish, outside white, hairy, anthers 2-celled. Grows upon interior hills and sea-coast plantations. BALSAMIC RESIN (benzoin), occurs in lumps of yellowish-brown agglutinated tears which are internally milky-white, or in reddish-brown mass, mottled from the imbedded whitish tears. Soluble in 5 parts warm alcohol, in fixed alkaline solutions; when heated get fumes of benzoic acid; odor balsamic, agreeable; taste aromatic. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Wood, barks, etc. (in cake benzoin), but these remain behind when treated with alcohol or sublimed.

Commercial.—The resin is collected from wild and cultivated trees when 5–6 years old, and trunk 15–20 Cm. (6–8′) thick. Longitudinal or oblique incisions are made through the bark between the ground and its first branches, when the white liquid resin slowly exudes; this soon, by exposure to air and sun, concretes and is scraped off with knives. Only unhealthy trees yield resin, and as it is a pathologic result, they contain no resin-receptacles. The annual yield per tree is 3 lbs. (1.5 Kg.), for twelve years, when they are cut down; the first three years' product is best (fuller of white tears, most fragrant), being called natively *head benzoin;* the next 7–8 years' yield contains less white tears, is browner—*belly benzoin;* after trees are felled and stems split an inferior quality is scraped off which is dark, mixed with wood, bark and other impurities—*foot benzoin.* These variety names correspond to our *superior, medium, inferior,* having their relative values, 105, 45, 18. It is received at the Sumatra ports in cakes wrapped in matting; here it is softened by heat, packed in chests and sent to Penang and Singapore, thence into commerce; in Siam it is conveyed on bullocks' backs to Menam River, thence into market in cubical blocks, via Bangkok. We have several varieties:

FIG. 291.



Styrax Benzoin; 1, flowering twig; 2, vertical section of flower; 3, diagram of the flower; 4, fruit, with upper portion laid bare, showing channelled surface; 5, anther; 6, seed, longitudinal section.

1. *Sumatra, Penang.*—This is grayish-brown, with many white tears, by age reddish-brown, partly soluble in carbon disulphide; odor weak, storax-like; inferior kinds have few or no tears, but many chips of wood, bark, etc.

2. *Siam.*—Considered best, reddish-brown, in large or small tears, soluble in carbon disulphide; odor strongest, most agreeable, vanilla-like; taste bitter. Occurs in two forms (*a*) tears or lumps, (*b*) amygdaloid. The tears are almond-shape, often 2.5 Cm. (1′) long,

more or less flattened; when these become agglutinated with a reddish-brown substance we have the amygdaloid.

3. *Palembang.*—This resembles Sumatra, but is somewhat more transparent, and is said to yield a greater percentage of benzoic acid.

4. *False Benzoin, Catappa Benzoin* (*Bu'ceras* (*Termina'lia*) *angustifo'lius,*—Combretaceæ).—This is whitish-brown, being obtained by incisions. The quality depends, in all these varieties, upon the amount of tears, but the Siam is the best flavored.

CONSTITUENTS.—Benzoic acid 12–24 p. c., Resins (three), cinnamic acid, $C_9H_8O_2$, volatile oil, vanillin and styrol, C_8H_8 (Siam).

Acidum Benzoicum. Benzoic Acid, $HC_7H_5O_2$, *official.*—(Syn., Acidum Benzoicum Sublimatum, Flores Benzoes, Flowers of Benzoin; Fr. Acide benzoïque, Fleurs de Benjoin; Ger. Benzoesäure, Benzoeblumen.) It is an organic acid usually obtained by the sublimation of benzoin (sometimes having an equal weight of sand added) between the temperatures 150–180° C. (302–356° F.). It is also made from hippuric acid (horse and cattle urine, furnishing the *German benzoic acid*), as well as synthetically from phthalic acid (naphtalin), but it is chiefly prepared artificially from toluene (toluol), $C_6H_5CH_3$, by converting it first into benzo-trichloride and treating this with water under pressure; it occurs in white or yellowish lustrous scales or friable needles; slight odor of benzoin; warm acid taste, partially volatile at warm temperature, sublimes at 100° C. (212° F.), melts at 121.4° C. (250.5° F.), at higher temperature is consumed, leaving no residue; darkens by exposure to light. Soluble in alcohol, ether, and chloroform. *Test:* Heat with three parts of slaked lime get benzol; when heated to 45° C. (113° F.) with potassium permanganate in stoppered test-tube, upon cooling should not get odor of oil of bitter-almond (abs. cinnamic acid). Dose, gr. 5–15 (.3–1 Gm.).

Resins.—One is extracted along with benzoic acid by boiling solution of potassium carbonate in excess; another is dissolved from the residue by ether, while the third is effected by neither solvent, hence left as a residue. With melted potassa get paroxybenzoic acid, $C_7H_6O_3$, protocatechuic acid, $C_7H_6O_4$, and pyrocatechin, $C_6H_6O_2$.

Acids (two).—Usually here present in equal quantities—can be separated by their degree of volatility, benzoic acid melting at 121.4° C. (250.5° F.) and the two mixed (1 cinnamic, 2 benzoic) at 25.5° C. (78° F.).

Vanillin, $C_8H_8O_3$.—Is obtained by treating Siam benzoin with caustic lime, precipitating benzoic acid with hydrochloric acid and shaking liquid with ether.

PREPARATIONS.—I. BENZOIN: 1. *Adeps Benzoinatus.* Benzoinated Lard. (Syn., Benzoated Lard, Unguentum Benzoini, Axungia Balsamica—Benzoinata or Benzoata; Br. Adeps Benzoatus; Fr. Axonge (Graisse) benzoinée (balsamique); Ger. Benzoe (Benzoinirtes) Schmalz.)

Manufacture: 2 p. c. Heat gently for two hours 2 Gm. tied in muslin, with lard 100 Gm. When for hot-weather use can replace 5–10 p. c. of lard with white wax.

2. *Tinctura Benzoini.* Tincture of Benzoin. (Syn., Fr. Teinture de Benjoin; Ger. Benzoëtinktur.)

Manufacture: 20 p. c. Macerate for seven days 20 Gm. in alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.); largely externally.

3. *Tinctura Benzoini Composita.* Compound Tincture of Benzoin. (Syn., Friar's or Turlington's Balsam, Tinctura Balsamica, Balsamum Commendatoris, Elixir Traumaticum; Fr. Teinture balsamique, Baume du Commandeur de Permes; Ger. Persischer Wundbalsam.)

Manufacture: 12 p. c. Digest gently for two hours 12 Gm. + storax 8, balsam of tolu 4, purified aloes 2, with alcohol q. s. 100 Cc., filter. Dose, ʒss–1 (2–4 Cc.); mostly externally.

II. BENZOIC ACID: 1. *Tinctura Opii Camphorata,* $\frac{2}{5}$ p. c. Dose, ʒss–2 (2–8 Cc.).

PROPERTIES.—Stimulant, expectorant, antiseptic, diuretic, antipyretic. It is eliminated slightly by the skin, salivary glands and broncho-pulmonary mucous membrane, but mostly by the kidneys, where it is converted into hippuric acid which renders alkaline urine acid, increases the flow, disinfects and stimulates the genito-urinary tract.

USES.—Chronic laryngitis, diarrhœa, dysentery. Locally the tincture as a stimulant and protective to wounds, to arrest coryza. Benzoic Acid—for bronchitis, genito-urinary troubles, uric acid deposits, cystitis, acute gonorrhœa, phosphatic gravel, incontinence of urine, rheumatism, Bright's disease, albuminuria, dressing to wounds, ulcers.

Incompatibles: The tinctures with all aqueous preparations.

68. OLEACEÆ. Olive Family.

O-le-a'se-e. L. *Ole-a* + aceæ, Gr. *ἐλαία,* olive tree, *ἔλαιον, oleum,* oil; *i. e.*, referring to the oleaginous fruit. Trees or shrubs. Distinguished by stamens 2–4, inserted on corolla; ovary 2-celled, superior; ovules 2 in each cell; calyx and corolla 4–8-cleft, regular; fruit capsule, samara, berry or drupe, often 1-seeded; temperate climates, tropics; tonic, febrifuge, purgative, perfumery (vol. oil), fragrant flowers; hardwood, dye.

Genera: **1. Olea. 2. Fraxinus.**

OLEA. OLIVE.

Oleum Olivæ. Olive Oil, *official.*

Olea europæa, *Linné.* } A fixed oil, expressed from the ripe fruit.

Habitat. Asia, S. Europe (Spain, Portugal, Asia Minor, Syria, Italy, S. France), Algeria, cultivated in S. United States (Fla., Cal.), S. America.

Syn. Olive Gum, Lucca Gum, Olive (Bark) Leaves, Sweet Oil. Fr. Huile d'Olive. Ger. Oleum Olivarum, Olivenöl.

O'le-a. L. olive, fr. Gr. *ἐλαία*, olive tree, *oliva*, the fruit, *oleum*, the juice or oil from the fruit.

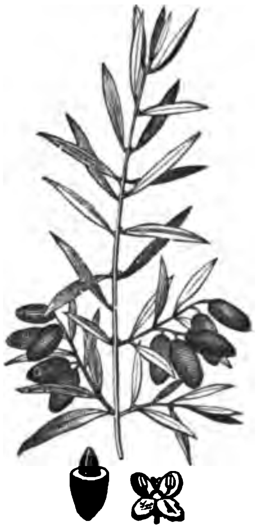
Eu-ro-pæ'a. L. European; *i. e.*, its habitat.

PLANT.—When wild a branched, thorny shrub; under cultivation a tree 3–9 M. (10–30°) high, resembling white willow; bark grayish-white; leaves 5–6 Cm. (2–2½′) long, lanceolate, acute, entire, coriaceous, glabrous, upper side glaucous-green, the lower silvery-white; flowers many, small, creamy-white, diandrous, racemes; fruit drupe, 12–25 Mm. (½–1′) long, ovoid, pointed, olive-green then deep-purple, sarcocarp firm, fleshy, internally greenish and filled with oil; stone (putamen) thick, bony, ovoid, 1-seeded.

CONSTITUENTS.—FRUIT SARCOCARP: Fixed oil 70 p. c., water 25 p. c.

Oleum Olivæ. Olive Oil.—Pale-yellow, oily liquid; slight odor; nutty, oleaginous taste, afterwards faintly acrid; sp. gr. 0.915; soluble in ether, chloroform, carbon disulphide; at 0° C. (32° F.) forms a whitish, granular mass. Contains mainly olein 70 p. c.; the solid fats are chiefly palmitin 25 p. c., arachin and stearin; also cholesterin, $C_{26}H_{44}O$, soluble in alcohol. *Tests:* 1. 10 drops oil + 5–6 drops sulphuric acid on porcelain slab, gives no brown-red nor greenish-brown color; agitated with sulphuric and nitric acid, remains pale-yellow or greenish. 2. 6 Gm. oil + 1.5 Gm. nitric acid + 0.5 Gm. water, shaken two minutes in test-tube, then heated on water bath fifteen minutes, should leave the oil light-yellow, not becoming orange or reddish-brown, and on standing twelve hours should form solid yellowish mass (abs. cotton-seed oil and other seed oils). 3. Should not turn green with sulphuric and nitric acid (abs. sesamum oil). The mixed fat acids, separated after saponification, melt at 26.5° C. (80° F.) and begin to solidify at 17.5° C. (63.5° F.). Dose, adult, ℥ss–1 (15–30 Cc.); infant, ʒj–2 (4–8 Cc.), in emulsion.

FIG. 292.



Olea europæa.

ADULTERATIONS.—Chiefly cotton-seed oil, also poppy, sesamum, and ground-nut oils, etc.; all of these congeal at much lower temperature, and do not solidify when shaken with 12 parts mercuric nitrate, as does pure olive oil.

Commercial.—Tree has been successfully grown in California, but we depend solely upon foreign supply. Oil is obtained by crushing ripe fruit short of the putamen, and subjecting this marc, in coarse bags, to strong pressure; the oil is run into vessels containing water, from which it is skimmed after a few days' subsidence; this is the first grade or *virgin oil.* The pressed-cake is taken from the bags, broken up finely with hot water, and again subjected to greater pressure, when both water and oil are expressed; the latter being drawn off from the surface to constitute our *second grade oil.* The remaining marc contains 9–12 p. c. oil, which can be extracted by carbon disulphide, or by mixing with hot water and allowing partial fermentation, thus yielding a disagreeably smelling oil on the surface, *huile d'enfer*. Sometimes inferior fruit is allowed to ferment in heaps or vats, giving us by expression also an inferior oil, *huile fermentée*. The oil enters commerce in bottles, jugs, and barrels, under the brands: Provence, Florence, Gallipoli, Spanish, and Sicily; the best from S. France, but Italy furnishes one-half and Spain one-fifth of the entire output.

PREPARATIONS.—1. *Sapo*. Soap. Sodium Oleate, $NaC_{18}H_{33}O_2$. (Syn., White Castile Soap, Sapo Durus, Hard Soap; Fr. Savon blanc (d'Espagne); Ger. Seife, Spanische Seife.)

Manufacture: Olive oil and soda are boiled together until saponified, $C_3H_5(C_{18}H_{33}O_2)_3 + 3NaOH = 3NaC_{18}H_{33}O_2$ (hard soap) $+ C_3H_5(OH)_3$. It is whitish, hard, solid, easily cut when fresh, faint, peculiar odor, free from rancidity, disagreeable alkaline taste and reaction, soluble in water, alcohol. *Impurities:* Water, animal fats, metals, sodium carbonate, silica.

Preps.: 1. *Emplastrum Saponis*. Soap Plaster. (Syn., Emplastrum Saponatum; Fr. Emplastrum cum Sapone, Emplâtre de Savon; Ger. Seifenpflaster.)

Manufacture: Soap 10 Gm. + water q. s. for paste, then mix with lead plaster, previously melted, 90 Gm.; evaporate slightly.

2. *Linimentum Saponis*. Soap Liniment. (Syn., Tinctura Saponis Camphorata, Liquid Opodeldoc, Camphorated Tincture of Soap, Spiritus Nervinus Camphoratus; Fr. Liniment savonneux camphré; Ger. Linimentum Saponato-Camphoratum, (Liquidum), Opodeldok, Flüssiger Opodeldok.)

Manufacture: Dissolve camphor 4.5 Gm. in alcohol 75 Cc., to this add soap 7 Gm., oil of rosemary 1 Cc., shake, adding water q. s. 100 Cc.

Prep.: 1. *Linimentum Chloroformi*, 70 p. c.; externally.

2. *Ceratum Cetacei*, 55 p. c.
3. *Emplastrum Ferri*, 5 p. c.
4. *Emplastrum Picis Burgundicæ*, 5 p. c.
5. *Emplastrum Plumbi*, 60 p. c.
6. *Unguentum Diachylon*, 49 p. c.

PROPERTIES.—Nutritious, demulcent, emollient, laxative, protection to mucous membrane against acrid or poisonous substances; it increases secretion of bile, peristalsis and dissolves cholesterin, the chief constituent of gallstones. Like other oils, it is partly emulsified and saponified in the intestines, its glycerin being set free, and fatty acid combining with free alkalies to form soap, which with the emulsion forms molecular basis of the chyle. It enters the blood through the lacteals, being finally oxidized into CO_2 and H_2O. Soap has same properties.

USES.—Gallstones, cantharides and other poisoning, infantile constipation in enema. Externally, burns, skin inflammations, to protect from air, insect bites, stings, bruises, sprains, wounds, engorged mammæ, rectal ascarides; facilitates removal of crusts, scales, etc., and introduction of bougies, catheters, pessaries, sounds, specula; to lubricate machinery, in making liniments, plasters, cerates, ointments, etc.

Allied Products:

1. *Olive Gum, Lecca Gum;* resinous substance which exudes spontaneously from the trees. 2. *Leaves and young bark;* used externally as astringents, antiseptics; internally as tonics in intermittents. 3. *Olive Wood;* has beautiful veins, pleasant odor, capable of fine polish, highly esteemed for backs of brushes, boxes, and in cabinet work. 4. *Olive Fruit;* as a dessert—for this the unripe fruit is repeatedly steeped in water containing lime and ashes, then bottled in a slightly aromatic, concentrated salt solution; the small French or Provence and the large Spanish olives are used for this purpose.

MANNA. MANNA.

Fraxinus
Ornus, *Linné.* } The concrete saccharine exudation.

Habitat. Mediterranean Basin, Asia Minor to Spain.

Syn. Manna (Flowering) Ash, European Manna Tree. Fr. Manne. Ger. Manna.

Frax′i-nus. L. for ash tree, fr. Gr. *φράσσω—ξω*, to fence in, enclose; *i. e.*, the wood is used in making hedges or fences, thus protecting things and places.

Or′nus. L. Wild Ash, fr. Heb. *oren*, Gr. *ορεινος*, classic name for wild mountain ash.

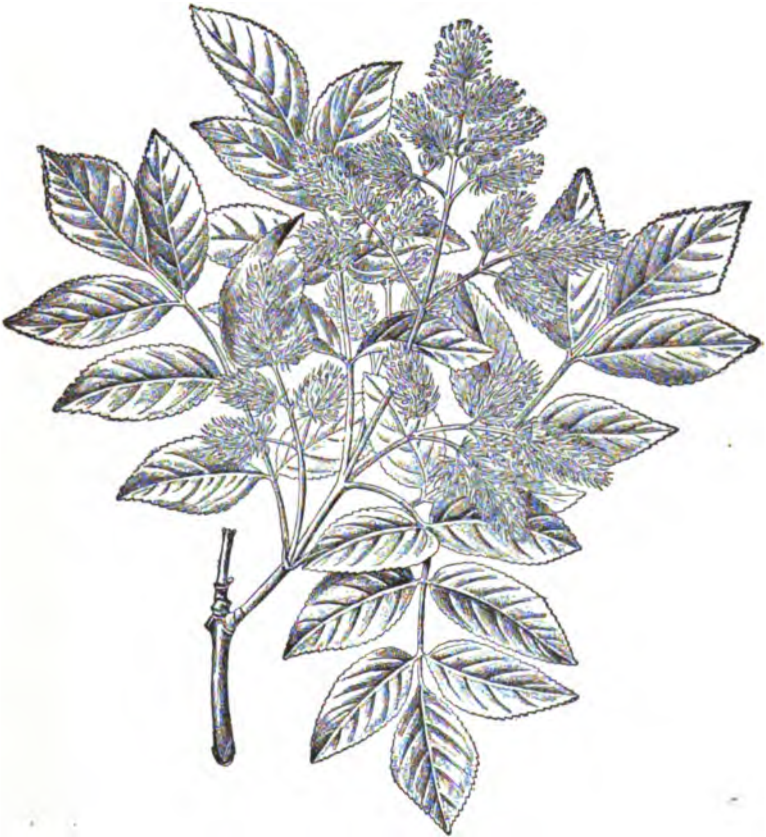
Man′na. L. fr. Gr. *μάννα*, Heb. *man*, Ar. *mann*, gift (of heaven) = divinely supplied food; *i. e.*, to the Israelites in their journey through the wilderness of Arabia.

PLANT.—Small tree 4.5–7.5 M. (15–25°) high; stem slender, bark gray, with leaf-scars on young twigs; leaves imparipinnate, 15–20 Cm. (6–8′) long; leaflets 4 pairs, 2.5–5 Cm. (1–2′) long, oval, acuminate, serrate, bright-green, petiolate; flowers May–June, small, numerous, white, panicles, petals, 4 Mm. ($\frac{1}{6}$′) long; fruit samara, 2.5 Cm. (1′) long, 4 Mm. ($\frac{1}{6}$′) wide. JUICE (manna), in flattish 3-edged pieces, occasionally 20 Cm. (8′) long, 5 Cm. (2′) broad, usually smaller; friable, yellowish-white; internally white, porous, crystalline, or in fragments of varying size, brownish-white, surface glutinous, inside white, crystalline; odor honey-like; taste sweet, bitter, acrid. Manna in brownish viscid masses, with few or no fragments of a crystalline structure should be rejected. *Test:* Manna 5 parts heated to boiling with alcohol 100 parts, the filtrate should quickly deposit mannit crystals. *Solvents:* hot or cold water; alcohol. Dose, ʒj–8 (4–30 Gm.).

ADULTERATIONS.—With products of allied species, bread crumbs, starch, glucose, wood, bark, etc.

Commercial.—The manna ash is so graceful as to be often planted in European gardens, yards, etc., for ornament, being introduced in 1710. In Sicily whole plantations are cultivated for the juice, which is obtained from the trees when eight years old, and stem 7.5–10 Cm. (3–4′) thick, by cutting through the bark to the wood transverse incisions 2.5–5 Cm. (1–2′) long, and 2.5 Cm. (1′) apart, with a curved knife. The first cut is nearest the ground, and another is made directly above it every day during warm weather, July–Aug.; the next year this is repeated on other portions of the stem, and so on yearly for 10–12 seasons, when, being spent, the trees are cut down and shoots allowed to spring from the stump. From these incisions manna exudes as a clear liquid, which soon concretes on the stem, or on sticks, straws, etc., placed in the incisions for that purpose. We have several varieties: 1. *Flake, Manna Canulata;* obtained when juice abundant, from upper incisions, which supply a product less fatty, consequently dries easily in tubes or flat pieces. 2. *Small, Tolfa, Sorts, Manna Communis,* in tears, from lower incisions, into which leaves, etc., are placed for it to congeal upon; this is more gummy, sticky, less crystalline, inferior—some is scraped from the trees. 3. *Fat, Manna Pinguis,* in brown, viscid masses, non-crystalline; flows Oct.–Nov. down the trunk, full of impurities. Manna is dried upon shelves, packed for market in tin-lined deal boxes having partitions.

FIG. 293.



Fraxinus Ornus, branch showing leaves and flowers.

CONSTITUENTS.—Mannit 60–90 p. c., Glucose, mucilage, fraxin, resin.

Mannit, $C_6H_8(OH)_6$.—Obtained with boiling alcohol and recrystallizing from the same several times; occurs in white prisms, soluble in 6.5 parts water, by oxidation gives fermentable mannitose and various acids.

Glucose.—Sometimes 16 p. c. **Mucilage** and **Fraxin**, $C_{22}H_{36}O_{20}$, are mostly in inferior grades; to this latter are due the fluorescence of the aqueous solution and the green color seen in some manna.

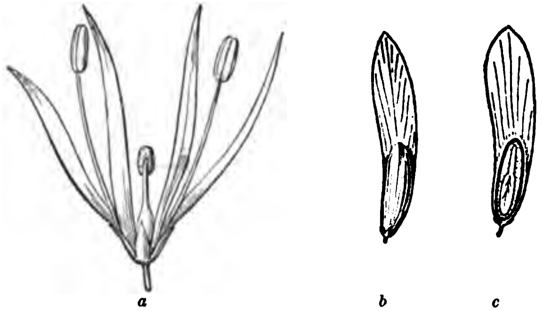
PREPARATIONS.—1. *Infusum Sennæ Compositum*, 12 p. c. Dose, ℥j–3 (30–90 Cc.).

Unoff. Prep.: Syrup.

PROPERTIES.—Laxative, demulcent, expectorant, cholagogue, may cause flatulence and colic; action slow and constringes secondarily.

USES.—Usually given with other medicines, as senna, rhubarb, magnesia, neutral salts, etc., to which it adds purgative properties, and by its sweetness disguises disagreeable taste of its associates. Good in piles, genito-urinary irritation, pregnant constipation. Mostly given to children and delicate persons, for whom its sweetness peculiarly adapts it.

FIG. 294.



Fraxinus Ornus; *a*, flower opened; *b*, single winged fruit; *c*, longitudinal section of same.

Allied Products:

1. *F. exce'lsior, European Ash.*—S. Europe. Produces manna identical with the official.

2. *La'rix Larix* (*europæ'a*), *Briançon Manna* (Pinaceæ); *Que'rcus Vallo'nea*, *Armenian Manna* (Fagaceæ); *Alha'gi camelo'rum*, *Persian Manna* (Papilionaceæ); *Eucaly'ptus gonioca'lyx*, *E. Gu'nni* and *E. vimina'lis* (Myrtaceæ); *Ta'marix manni'fera*, *Tamarisk Manna* (Tamaricaceæ). All these produce sweet exudations or mannas (not met in commerce), containing melezitose, $C_{12}H_{22}O_{11}3H_2O$, or melitose, $C_{12}H_{28}O_{14}$, or some such saccharine principle. The saccharine products of some insects as *Trehala*, cocoon of *Lavi'nus mellifi'cus* (Syria) and *Lerp*, upon *Eucalyptus dumosa* (Australia) contain trehalose sugar, and are used as manna.

69. LOGANIACEÆ. Loganía Family.

Lo-ga-ni-a'se-e. L. *Logani-a* + aceæ, after J. Logan, a distinguished botanist. Shrubs, herbs, or trees. Distinguished by poisonous properties; leaves entire, stipulate or raised stipular line; calyx 4–5-cleft, inferior; corolla 4-, 5-, 10-cleft, regular; stamens epipetalous, 4, 5, 10; ovary 2-, 3-, 4-celled, superior; fruit capsule or drupe. Connects Gentianaceæ, Apocynaceæ, Scrophulariaceæ (from which distinguished by having stipules), and Rubiaceæ (which has no free ovary); tropics; nervine, tonic, anthelmintic, poisonous.

Genera: 1. **Gelsemium.** 2. **Spigelia.** 3. **Strychnos.**

GELSEMIUM. GELSEMIUM (YELLOW JASMINE).

Gelsemium sempervirens, (*Linné*) *Aiton filius.* } The rhizome and roots.

Habitat. United States, southward, Va. to Fla., Ala., rich, moist soil.

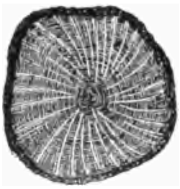
Syn. Wild or Carolina Jessamine, Woodbine, Evening Trumpet-flower. Br. Gelsemii Radix; Fr. Jasmin sauvage. Ger. Gelsemie, Giftjasmin, Gelber Jasmin.

Gel-sem′i-um. L. *gelsomino,* jasmine, altered from *gelsemium, gelseminum,* a form of *jasminum,* all medieval names for the jasmines (or jassamines) with which this was classed.

Sem-per′vi-rens. L. *semper,* always, + *viren(t)s,* ppr. of *virere,* to be green, evergreen; *i. e.,* the leaves.

PLANT.—Beautiful climber, ascending large trees, forming festoons from one to another, and when in bloom, delightfully perfuming the surrounding atmosphere; stem twining, smooth, shining, hollow, purplish; leaves perennial, lanceolate, entire, dark-green above, paler beneath; flowers Jan.–April, deep-yellow, large; corolla funnel-shape, 2.5–4 Cm. (1–1½′) long, fragrant, poisonous; fruit flat, brown, capsule, 18 Mm. (¾′) long, 2-celled, 4–6 winged seeds in each cell. RHIZOME, cylindrical, 15 Cm. (6′) long, or in sections 2.5 Cm. (1′) long, 2.5 Cm. (1′) thick; roots thinner, yellowish-brown with purplish-brown longitudinal lines, tough, fracture splintery; bark thin with silky bast-fibres closely adhering to the pale-yellowish, porous wood, which has fine medullary rays, and in the rhizome a thin pith; odor aromatic, heavy; taste bitter. *Solvents:* diluted alcohol; water partially. Dose, gr. 2–10 (.13–.6 Gm.).

FIG. 295.



Gelsemium sempervirens, rhizome, transverse section.

CONSTITUENTS.—Gelsemine, gelseminine, gelseminic (gelsemic) acid (possibly identical with æsculin), volatile oil, resin, starch, calcium oxalate.

Gelsemine, $C_{49}H_{63}N_5O_{14}$.—Obtained by adding acetic acid to concentrated tincture, precipitating resin with water; concentrate filtrate, remove gelsemic acid with chloroform or ether, precipitate alkaloid with sodium carbonate, and extract it with chloroform, ether or benzin. It is amorphous, white, very bitter, alkaline; with hydrochloric or nitric acid forms crystalline salts; with sulphuric acid + manganese dioxide get cherry-red, becoming olive-green. Dose, gr. $\frac{1}{60}$–$\frac{1}{20}$ (.001–.003 Gm.).

Gelseminine, $C_{12}H_{14}NO_2$.—Small, white, bitter crystals, soluble in alcohol, ether, chloroform, forms salts soluble in water (hydrochlorate, nitrate, sulphate, etc.). Dose, gr. $\frac{1}{120}$–$\frac{1}{30}$ (.0005–.002 Gm.).

PREPARATIONS.—1. *Extractum Gelsemii Fluidum.* Fluid Extract of Gelsemium. (Syn., Fr. Extrait liquide de Gelsemium; Ger. Flüssiges Gelsemium-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏ij–10 (.13–.6 Cc.).

2. *Tinctura Gelsemii.* Tincture of Gelsemium. (Syn., Fr. Teinture de Gelsemium; Ger. Gelsemiumtinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏x–60 (.6–4 Cc.).

Unoff. Preps.: Extract (alcoholic). Dose, gr. $\frac{1}{2}$–4 (.03–.26 Gm.). Gelsemin (resinoid). Dose, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.008–.03 Gm.).

PROPERTIES.—Nervine, sedative, mydriatic, antispasmodic, antiperiodic. Resembles very much in action hemlock, and somewhat digitalis, aconite, veratrum, antimony; heart action rendered slower and weaker, arterial tension lowered.

Large doses paralyze sensation and motion, diminish pulse, respiration and temperature, dilate pupils, project eyeballs, dizziness, lower jaw falls, cannot enunciate, convulsions like strychnine, respiration ceases, finally heart is asphyxiated, then death. Consciousness is retained nearly to the end.

USES.—Rheumatic neuralgia, intermittent, typhoid, and yellow fevers, lung troubles, dysmenorrhœa, delirium tremens, chorea, hysteria, epilepsy, sunstroke, tetanus, inflammation from poison-oak, coryza, opium poisoning, odontalgia, cardiac palpitation, mania.

Poisoning: Give evacuants (stomach pump, mustard, zinc sulphate) or wash out stomach with tannic acid solution, follow with hypodermic morphine, atropine, stimulants, ammonia, coffee, alcohol, digitalis, strychnine, external heat and rubbing.

Incompatibles: Cardiac and diffusible stimulants, caustic alkalies, tannin.

Synergists: Motor depressants.

SPIGELIA. SPIGELIA (PINK ROOT).

Spigelia marylandica, *Linné.* } The rhizome and roots.

Habitat. United States, Maryland, southward, West to Texas, Wis., in rich woods.

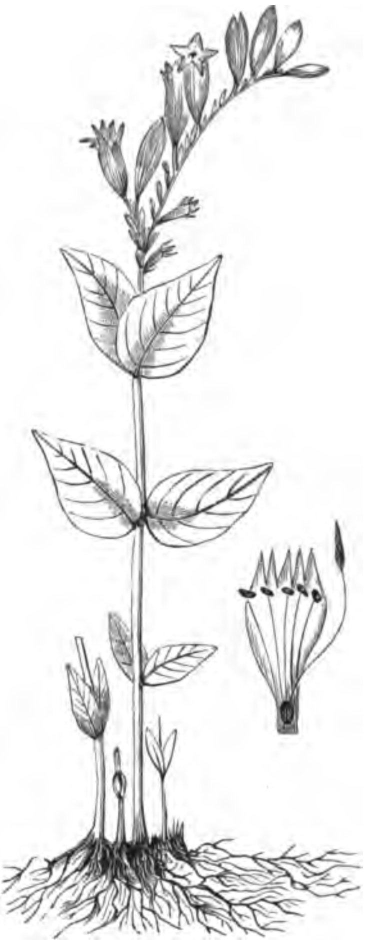
Syn. Maryland-, Carolina-, Indian-, or India-pink, Worm Grass or Weed, Star Bloom, American Worm Root, Loricera. Fr. Spigélie du Maryland. Ger. Spigelie, Marylandische Spigelie.

Spi-ge′li-a. L. *Spigelius*, after Adrian von der Spiegel (1558–1625), Prof. Anat. and Surg., at Padua, Flemish botanist who first gave directions for preparing an herbarium.

Ma-ry-lan′di-ca. L. for Maryland; *i. e.*, its supposed habitat and one most northern.

PLANT.—Perennial herb; stems several, .3–.6 M. (1–2°) high, erect, round below, square above, purplish, smooth; leaves sessile, ovate-lanceolate, 5–7.5 Cm. (2–3′) long, entire; flowers June–July, 4–12, large, sessile, on one side of stem above the leaves, spike; corolla funnel-shape, 5 Cm. (2′) long, scarlet-red outside, yellow inside; fruit compressed, 2-celled, yellow; seeds few, yellow. RHIZOME, horizontal, 5 Cm. (2′) long, 3 Mm. (⅛′) thick, bent, dark-purplish-brown, branched, on upper side cup-shaped scars; on the lower, many thin, brittle, lighter-colored roots 10 Cm. (4′) long, inside—whitish wood and dark-colored or decayed pith; odor aromatic; taste sweetish, bitter, pungent. Should not be confounded with rhizome of *Phlo′x caroli′na, Carolina Pink*, which is short, upright, roots brownish-yellow, coarse, straight with straw-colored wood under a readily removable bark. *Solvents:* diluted alcohol; boiling water. Dose, ʒss–2 (2–8 Gm.); children, gr. 10–20 (.6–1.3 Gm.).

FIG. 296.



Spigelia marylandica.

Commercial.—Pinkroot very seldom grows north of the Potomac river, and flourishes in rich soil near the borders of woods. The Creek and Cherokee Indians formerly collected much of it in Georgia, by pulling up entire plant and sending that into market in bales, 300–350 lbs. (136–158 Kg.). Now only the official portion is collected, carefully dried, packed in casks or bales, and sent into commerce via St. Louis and New Orleans, being most all from S. W. States. That in casks is preferred, owing to it being less frequently damp and mouldy.

CONSTITUENTS. — Bitter principle, Spigeline, volatile oil, resins, tannin, wax, fat, gum.

Bitter principle.—This is precipitated by tannin, but not by lead acetate, is soluble in water, alcohol, insoluble in ether.

Spigeline. — Volatile alkaloid obtained by distilling with milk of lime over a paraffin bath, collecting distillate in hydrochloric acid, evaporating to dryness, crystallizing from alcoholic solution. *Tests:* 1. With iodine get brownish-red precipitate. 2. With Mayer's test (potassio-mercuric iodide) white crystalline precipitate, soluble in alcohol, ether, acids, and its solubility in this latter makes it differ from all other alkaloids. 3. Benzin removes from *Phlox carolina* a hydrocarbon (crystalline, white, tasteless), 1 p. c., fat, wax, red coloring matter, thus somewhat differing from spigelia when similarly treated.

Preparations.—1. *Extractum Spigeliæ Fluidum.* Fluid Extract of Spigelia. (Syn., Fr. Extrait liquide de Spigélie; Ger. Flüssiges Spigelien-Extrakt.)

Manufacture: Macerate, percolate 100 Gm., with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.). Child three years old, ♏x–20 (.6–1.3 Cc.).

Unoff. Prep.: Compound Infusion (*Worm Tea*), 15 Gm. + senna 10, fennel 10, manna 30, water q. s. 500 Cc. Dose, ℥ij–5 (60–150 Cc.).

Properties.—Anthelmintic, toxic, mydriatic. Large doses cause narcotic poisoning, vertigo, dim vision, mydriasis, spasms, convulsions, but if it should purge as it often does, only a few of these symptoms occur—hence no danger when combined with a direct cathartic.

Uses.—Against round worms (*Ascaris lumbricoides*); usually associated with a cathartic as senna, calomel, etc., which hastens the benumbed worm out of the system before it has time to recover from the shock of the spigelia.

Poisoning: Give wine, ammonia, brandy, diffusible stimulants.

Allied Plants:

1. *S. anthe'lmia, Demerara Pink Root, Worm Grass.*—W. Indies. Used for a long time by the native Indians as a vermifuge and narcotic; fresh root has nauseous odor, is bitter, acrid and kills cattle.

2. *Phlo'x caroli'na, Carolina* or *Georgia Pink.* This has a knotty and lighter colored rhizome with a central pith but is also a good anthelmintic, as is likewise *P. glabe'rrima.*

NUX VOMICA. NUX VOMICA.

Strychnos
Nux-vomica, *Linné.* } The seed.

Habitat. India, Hindustan, E. India Islands (Malabar, Ceylon, Java, N. Australia).

Syn. Dog-, Quaker- or Bachelor's Buttons, Vomit or Poison Nut, Dog Poison, Ratsbane, False Angustura, Columbrina, Ordeal Root, Nux Metella, Semen Nucis Vomicæ. Fr. Noix vomique. Ger. Semen Strychni, Brechnuss, Krähenaugen.

Strych'nos. L. fr. Gr. στρύχνος, night shade, equivalent to L. *solanum*, used anciently for several poisonous plants, but not for the present one.

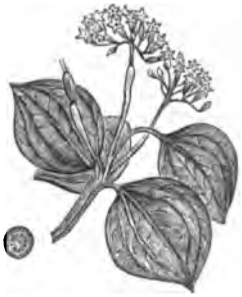
Nux' Vom'i-ca. L. *nux*, a nut, + *vomere*, to vomit; *i. e.*, excessive doses may vomit, or require vomiting to save life, small doses may allay it.

Plant.—Medium size tree, trunk short, thick, crooked, resembling our dogwood, branches irregular, bark yellowish-gray, nearly smooth; leaves exstipulate, 5–10 Cm. (2–4′) long, roundish, oval, 3–5-nerved, apex acute, entire, shining; flowers in winter, whitish, funnel-shaped, 8 Mm. (⅓′) long, paniculate cymes; fruit small, shining, globular berry, resembling an orange, 4–5 Cm. (1½–2′) thick, rind tough, thin, orange-yellow when ripe, filled with a harmless, gelatinous pulp in which 1–5 seeds are irregularly immersed. Seed, 2.5 Cm. (1′) wide, 3 Mm. (⅛′) thick, orbicular, gray or greenish-gray; soft-hairy, silky lustre, slight ridge from centre of one side to the edge; usually flat or convex on one side, concave on the other; inside horny, somewhat translucent, tough, with large, circular cavity into which the heart-shaped, nerved cotyledons project; inodorous, persistent, bitter. It is best powdered by breaking into small pieces, drying fragments for several days with hot air, or carefully applied direct heat, when it is of a light-grayish-green color. There are several varieties: 1. *Bombay*, 2. *Cochin*, 3. *Madras*, 4. *Ceylon*, etc., the first-named being the best: *Solvents:* alcohol (75 p. c.); boiling water partially. Dose, gr. ½–5 (.03–.3 Gm.).

CONSTITUENTS.—Alkaloids 2.5–4 to 5.3 p. c.: Strychnine ¼–2 p. c., Brucine ½–2 p. c., Igasurine (probably impure brucine), all combined with Igasuric acid; Loganin, proteids 11 p. c., yellow coloring matter, fat, gum, sugar 6 p. c., ash 1–1.5 p. c. Dunstan and Short found total alkaloids to vary from 2.74 p. c. in small Madras to 3.90 p. c. in large, silky Bombay seeds, of which 30–50 p. c. was strychnine.

Strychnina, Strychnine, $C_{21}H_{22}N_2O_2$, *official.*—(Syn., Strychnia; Ger. Strychninum, Strychnin.) This alkaloid is not only found in nux vomica, but in other loganiaceous plants; it was discovered by Pelletier, 1818, and can be obtained by boiling powdered seeds with acidulated (HCl or H_2SO_4) water, thus liberating igasuric acid, mucilage, coloring matter, etc., and forming chlorides or sulphates of the alkaloids. Add milk of lime to decompose alkaloidal salts (forming $CaCl_2$ or $CaSO_4$) and to precipitate strychnine and brucine; wash precipitate, treat it with diluted alcohol to dissolve brucine, or with alcohol or benzene to take out strychnine, thus leaving brucine in the mother-liquor. If diluted alcohol used for brucine, then by boiling residue with alcohol strychnine is obtained; can purify with animal charcoal and reprecipitate with ammonia. Occurs in four-sided rhombic prisms, very bitter, soluble in boiling alcohol, 5 parts chloroform, 110 alcohol; forms numerous bitter, soluble salts (hydrochlorate, nitrate, phosphate, sulphate, etc.), all having the same dosage; when mixed with morphine can be dissolved out by chloroform. *Tests:* 1. With sulphuric acid + potassium dichromate get deep-violet or blue. 2. With sulphuric acid + lead peroxide or potassium ferricyanide get deep-violet or blue, then red, yellow. 3. With nitric acid + heat get picric acid, no effect with diluted nitric acid. 4. With 0.02 Gm. + 2 Cc. nitric acid in test-tube should only turn faintly yellow (limit of brucine). Commercial strychnine contains some homo-strychnine, $C_{22}H_{24}N_2O_2$. Dose, gr. $\frac{1}{60}$–$\frac{1}{20}$ (.001–.003 Gm.).

FIG. 297.



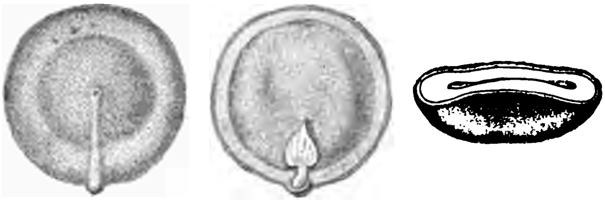
Strychnos Nux-vomica.

Strychninæ Sulphas, Strychnine Sulphate, $(C_{21}H_{22}N_2O_2)_2H_2SO_4 + 5H_2O$, *official.*—(Syn., Strychninum Sulfuricum; Fr. Sulfate de Strychnine; Ger. Schwefelsaures Strychnin.) Obtained by dissolving strychnine in hot diluted sulphuric acid (avoiding excess), setting aside to crystallize; it represents 78 p. c. of the alkaloid; occurs in white prismatic crystals, odorless, bitter, perceptible in solutions (1–700,000), soluble in 50 parts water, 109 alcohol, no residue. *Tests:* 1. With soda or potassa T. S. get white precipitate of strychnine, insoluble in excess. 2. With barium chloride T. S. get white precipitate, insoluble in hydrochloric acid. Should be kept in well-stoppered vials. Dose, gr. $\frac{1}{60}$–$\frac{1}{20}$ (.001–.003 Gm.).

Brucine (Brucina), $C_{23}H_{26}N_2O_4$.—Named after James Bruce (1730–1794), a Scotch traveler, and obtained in extracting strychnine; occurs in rectangular, octohedral crystals, containing $4H_2O$, soluble in 850 parts water, readily in chloroform, alcohol, ammonia, creosote. Forms numerous salts, less bitter than strychnine, 12 times weaker, 3 times slower physiologically. By some considered to be strychnine + resin, as it has same action. *Test:* With nitric acid get blood-red color, going to orange-yellow, now add stannous chloride, sulphurous acid, or any deoxidizing agent, get a violet-red (this completely bleaches morphine-red). Dose, gr. $\frac{1}{12}$–$\frac{1}{2}$ (.005–.03 Gm.).

Igasurine (Igasuria), fr. Malay, *igasura*, the nux vomica.—Obtained from mother-waters of strychnine and brucine after their precipitation with lime; occurs in white crystals; by some claimed to be a mixture of nine alkaloids, mostly brucine; others doubt its existence.

FIG. 298.



Nux vomica; whole seed, cut longitudinally, and cut transversely.

Igasuric Acid.—Identical with caffeo-tannic acid, amorphous, dark-green with ferric salts, by hydrolysis yields glucose and caffeic acid.

Loganin, $C_{25}H_{34}O_{14}$.—Bitter glucoside, in white prisms, soluble in water, alcohol. With sulphuric acid get red, then purple, and splits into sugar and loganetin.

PREPARATIONS.—1. *Extractum Nucis Vomicæ.* Extract of Nux Vomica. (Syn., Fr. Extrait de Noix-Vomique; Ger. Extractum Strychni, (Spirituosum) Brechnuss-Extrakt, (Weingeistiges) Krähenaugen-Extrakt.)

Manufacture: Contains 15 p. c. alkaloids; macerate, percolate 100 Gm. with alcohol 75 p. c. 100 Cc. + acetic acid 5, finishing with alcohol 75 p. c., q. s., distil off alcohol, shake with ether (to remove fat), filter, evaporate, add sugar of milk q. s. Dose, gr. $\frac{1}{8}$–1 (.008–.06 Gm.).

Prep.: 1. *Tinctura Nucis Vomicæ.* Tincture of Nux Vomica. (Syn., Fr. Teinture de Noix-Vomique; Ger. Tinctura Strychni, Brechnusstinktur, Krähenaugentinktur.)

Manufacture: Extract of nux vomica 2 Gm., dissolved in alcohol 75 p. c., q. s. 100 Cc. Dose, ♏v–20 (.3–1.3 Gm.).

2. *Extractum Nucis Vomicæ Fluidum.* Fluid Extract of Nux Vomica. (Syn., Fr. Extrait liquide de Noix-Vomique ; Ger. Flüssiges Krähenaugen (Strychnossamen)-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c. 100 Cc. + acetic acid 5 Cc., finishing with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏j–5 (.06–.3 Cc.).

Unoff. Preps.: Abstract. Dose, gr. $\frac{1}{4}$–2 (.016–.13 Gm.). *Decoction* of leaves used externally in rheumatism.

PROPERTIES.—Motor excitant, spinant, tonic, stomachic, respiratory, cardiac, muscular and nervous stimulant, antiseptic, poisonous. Strychnine and nux vomica are identical, increasing the vascularity of gastric mucous membrane, secretion of gastric juice and peristalsis by stimulating the intestinal muscular coat (purgative), stimulates direct the cardiac muscles or the motor ganglia and nerves of special sense; strychnine, full dose, gr. $\frac{1}{10}$ (.006 Gm.) gives dilated pupils, jerky limbs, spasmodic respirations, stiff lower jaw, cerebral tension, shuddering, depression, facial smile; if toxic dose, gr. $\frac{1}{2}$ (.03 Gm.) have within half an hour tonic or persistent convulsions of all extensor muscles, quickly recurring at every noise or irritation, body curves so as to be supported by head and heels, face wears a ghastly grin, corners of mouth turned upward, death in 2–3 hours from asphyxia, mind clear until near the end, when carbonic acid narcosis may set in. Thebaine (opium) acts similarly. The spasms of tetanus are constant, of strychnine intermittent, with meaningless smile; the modified lockjaw, absence of wound and rapidly developed symptoms differentiate the two. Strychnine is rapidly absorbed but slowly eliminated by urinary, salivary and cutaneous channels.

USES.—Strychnine was first used in paralysis, and now in atonic dyspepsia, gastric catarrh, bowel atony, pregnant and phthisis vomiting, nervous coughs, bronchitis, anæmia, paralytic condition, lead palsy, inebriate and diphtherial paralysis, amaurosis from lead, tobacco, alcohol, paralysis of bladder, incontinence of urine, sexual impotence, tetanus, chorea, epilepsy, delirium tremens, spermatorrhœa, neuralgia, dysmenorrhœa, diarrhœa, dysentery, cholera, antidote to chloral hydrate, morphine, physostigmine. A tolerance for it is soon established, but gr. $\frac{1}{12}$ (.005 Gm.) has killed, while gr. $\frac{1}{2}$–2 (.03–.13 Gm.) is, as a rule, considered fatal; extract, gr. 3 (.2 Gm.) has also killed.

Poisoning: Remove from all noise, use evacuants (stomach-pump, emetics, purgatives), follow with antidotes; tannin dissolved in water, charcoal, chloral hydrate and potassium bromide, by mouth or rectum, chloroform, ether, amyl nitrite (soluble iodides, tobacco, opium, physostigmine, atropine, conium, Indian hemp). Empty bladder often (catheter), give artificial respiration.

Incompatibles: Chloral hydrate, potassium bromide, tobacco, chloroform, ether, tannin, bromides, iodides, chlorides.

Synergists: Motor excitants, ergot, ustilago, electricity, cold.

Allied Products:

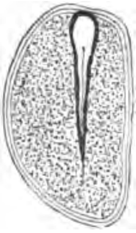
1. *The bark* was once (1806–1837) upon the market in England and

Holland, being usually mixed with Angustura, and since then has been known as *False Angustura Bark;* it is poisonous, gray, cork patches rust-color, warty, inside brown, fracture smooth, no white striæ (calcium oxalate); contains strychnine, brucine, etc. The wood is used in domestic medicine, all portions are medicinal.

Allied Plants:

1. *S. Igna'tia, Bean of St. Ignatius.*—The seed official, 1860–1890, Philippine Islands. Large climbing shrub, leaves ovate, acute at apex, smooth, flowers white, tubular, racemes; fruit resembles a pear, pericarp brittle; seeds 24, imbedded in bitter pulp, 25 Mm. (1′) long, 18 Mm. ($\frac{3}{4}$′) broad, ovate, triangular, brownish, covered with brown silky hairs, horny, very bitter; contains more strychnine, but less total alkaloids than nux vomica—strychnine 0.5–1.5 p. c., brucine 0.5–1.4 p. c., proteids 10 p. c.; used like nux vomica; in tincture. Dose, gr. $\frac{1}{2}$–3 (.03–.2 Gm.).

FIG. 299.



Ignatia: vertical section.

2. *S. Tieu'te.*—Java. Seeds resemble nux vomica but smaller, whiter; contain strychnine, brucine; extract used natively for arrow poison. *S. potato'rum.* India. Seeds subglobular, 12 Mm. ($\frac{1}{2}$′) wide, brownish-gray, not bitter, no strychnine; used natively for clearing muddy water. *S. colubri'na.* India. Yields true *Lignum Colubrinum*, for which nux vomica branches are often substituted. All parts bitter and contain strychnine and brucine; once used as antidote to snake-bites, hence the name.

3. *S. toxi'fera* (*Castelnœa'na*), *Curara, Curare, Woorara, Urari.*—Brazil, Guiana. Extract of bark (South American arrow poison), blackish, hygroscopic, bitter, friable, 75 p. c. soluble in water; contains curarine, $C_{18}H_{35}N$ (yellowish-brown, bitter alkaloid), resin, fat; diaphoretic, sedative, irritant; best drug in tetanus. Dose, gr. $\frac{1}{10}$–$\frac{1}{3}$ (.006–.02 Gm.).

70. GENTIANACEÆ. Gentian Family.

Jen-shia-na'se-e. L. *Gentian-a* + aceæ, fr. Gr. γεντιανή; *i. e.*, after Gentius, King of Illyria, who first discovered and experienced its virtues. Herbs or shrubs. Distinguished by being smooth, with bitter principles; leaves exstipulate, entire, glabrous, sessile; flowers regular, 5's, sometimes 4, 6, 8, 10; ovary 1-celled; fruit capsule, 1–2-celled, 2-valved; seeds many; universal; tonic, febrifuge, stomachic.

Genera: 1. **Gentiana.** 2. **Swertia.**

GENTIANA. GENTIAN.

Gentiana lutea, *Linné.* } The root.

Habitat. C. and S. Europe, mountains.

Syn. Yellow or Pale Gentian. Bitter Root or Wort, Felwort, Radix Gentianæ Rubræ—Luteæ or Majoris. Fr. Racine de Gentiane (de Gentiane jaune). Ger. Radix Gentianæ, Enzianwurzel, Bitterwurzel, Rother (Gelber) Enzian.

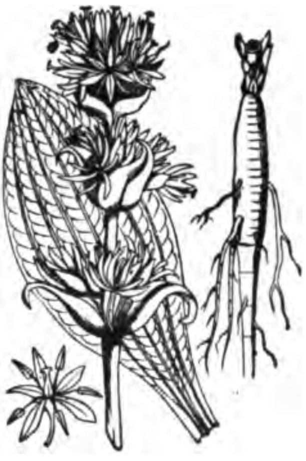
GENTIANACEÆ.

Gen-ti-a′na. L. see etymology, page 452, of Gentianaceæ.
Lu′te-a. L. *luteus*, golden-yellow ; *i. e.*, the flowers.

PLANT.—Large perennial herb, remarkable for beauty and size; stem thick, hollow above, .6–1.3 M. (2–4°) high, yellowish-green; leaves entire, 5–7-nerved, 15–30 Cm. (6–12′) long, ovate, glabrous, yellowish-green; flowers, June–Aug., numerous, in cymes of 20 or more; corolla 5 Cm. (2′) long, orange-yellow, 6 segments; fruit 1-celled, ovate capsule, 3 Cm. (1¼′) long, with many winged-seeds. ROOT, in nearly cylindrical pieces or longitudinal slices, .3–.6 M. (1–2°) long, or shorter, 2.5 Cm. (1′) thick, upper portion closely annulate, lower longitudinally wrinkled, yellowish-brown, inside lighter; flexible and tough when damp, brittle when dry, fracture uneven, bark thick, separated from the somewhat spongy meditullium by a black cambium line; odor peculiar, faint, more prominent when moistened; taste sweetish, persistent bitter. *Solvents:* water; diluted alcohol. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Through carelessness with roots of allied species, aconite, belladonna, white hellebore, orris, etc., none being yellow internally.

FIG. 300.



Gentiana lutea.

Commercial.—Gentian was used by the Greeks and Arabians; it grows in the Alps, Apennines, Pyrenees, 900–1,200 M. (3,000–4,000°) elevation, along with veratrum, the leaves of both closely resembling. Flourishes best in France, Switzerland, Portugal, Germany, England. Roots are dug, washed, dried in mountainous districts, and exported from Germany, also Marseilles.

CONSTITUENTS.—Gentiopicrin 0.1 p. c., Gentisin, gentianose, $C_{16}H_{66}O_{31}$ (uncrystallizable sugar), 14 p. c., pectin, fixed oil 6 p. c., ash 8 p. c.

Gentiopicrin, $C_{20}H_{30}O_{12}$.—Bitter glucoside obtained by making aqueous solution of alcoholic extract, from which it is absorbed by charcoal; now boil with alcohol, concentrate, treat with lead oxide to remove color, precipitate lead by hydrogen sulphide, agitate with ether, crystallize. It is soluble in water, dil. alcohol, with diluted acids splits into glucose and gentiogenin, $C_{14}H_{16}O_5$ (yellowish-brown).

Gentisin, Gentianin (*gentisic* (*gentianic*) *acid*), $C_{14}H_{10}O_5$.—Coloring matter, obtained by washing the alcoholic extract with cold water to remove bitter principle, afterwards with ether to remove fat, and finally crystallizing from alcohol; it is in yellow, tasteless crystals, partially soluble in alcohol, ether; colors ferric salts dark-brown. The pectin compound is precipitated by lead acetate.

PREPARATIONS.—1. *Extractum Gentianæ.* Extract of Gentian. (Syn., Fr. Extrait de Gentiane; Ger. Enzian-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with water q. s. Dose, gr. 2–10 (.13–.6 Gm.).

2. *Extractum Gentianæ Fluidum.* Fluid Extract of Gentian. (Syn., Fr. Extrait liquide de Gentiane; Ger. Flüssiges Enzian-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

3. *Tinctura Gentianæ Composita.* Compound Tincture of Gentian.

Manufacture: 10 p.c. Macerate, percolate 10 Gm. + bitter-orange peel 4, cardamom 1, with alcohol 60 p. c., q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

Unoff. Prep.: Compound Infusion. Dose, ℥ss–2 (15–60 Cc.).

Properties.—Tonic, bitter, increases appetite, digestion (action local). Large doses oppress stomach, irritate bowels, nauseate and vomit.

Uses.—Dyspepsia, atonic gout, amenorrhœa, hysteria, scrofula, intermittents.

Allied Plants:

1. *G. Ellio'ttii* (*Catesbœ'i*), *Elliott's Gentian.*—The root official, 1820–1880. United States, grassy swamps. Perennial herb, 20–60 Cm. (8–24′) high, rough; leaves 2.5–5 Cm. (1–2′) long, lanceolate, serrate; flowers, Oct., blue, 4 Cm. (1½′) long; corolla 10 segments, 5 inner fringed; root resembles the official; constituents and uses similar; in infusion, wine, tincture. *G. purpu'rea* (purplish flowers). *G. panno'nica* (dark-purple flowers), and *G. puncta'ta* (yellow but purple-dotted flowers). All grow along with official, and collected for it.

Fig. 301.

Gentian root; longitudinally sliced, about one-half natural size.

2. *Sabba'tia angula'ris, American Centaury.*—The herb official, 1820–1880. United States. Plant .3–.6 M. (1–2°) high, stem branched above, square, smooth; leaves ovate, 2.5 Cm. (1′) long, heart-shaped; flowers deep-rose, central star greenish, wheel-shaped, 5-parted, bitter; contains bitter principle, fat, erythrocentaurin. Used as tonic, febrifuge, diaphoretic, rheumatism, sore throat, fevers. Dose, gr. 15–60 (1–4 Gm.). *S. Ellio'ttii, Quinine Flower; S. campe'stris,* and *Erythræ'a Centau'rium, European Centaury.* All these can be used similarly.

CHIRATA. CHIRATA.

Swertia Chirayita (Chirata), (*Roxburg*) *Lyons.* } The entire plant.

Habitat. N. India, mountains, 1,500–2,700 M. (5,000–9,000°) elevation.

Syn. Bitter (stem) Stick, East India Balmony, Chiretta. Fr. Chirette. Ger. Chiretta, Ostindischer Enzian.

Swer'ti-a. L. in honor of Emanuel Swert, Holland florist, who published *Florilegium*, in 1612.

Chi-ray'i-ta, Chi-ra'ta. L. for E. India *kirâtas*, a race of mountaineers, among whom this plant grows, and by them extensively used.

Plant.—Large annual, 1.3–1.6 M. (4–5°) high; stem square above, thickened at nodes, large pith; leaves ovate, sessile, opposite, 5–10

Cm. (2–4′) long, root thick, tapering; flowers 4's, yellow. Should collect the entire plant when flowers begin decaying, when it is brown, smooth, inodorous, bitter; then dry and tie into bundles with bamboo, 1 M. (3°) long, weighing 1–2 lbs. (.5–1 Kg.). Enters market via Bombay, where it is garbled. *Solvents:* water; alcohol; diluted alcohol. Dose, gr. 15–30 (1–2 Gm.).

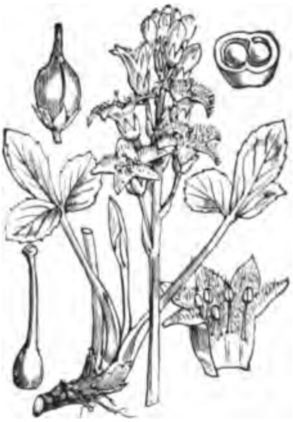
CONSTITUENTS.—Ophelic acid, Chiratin, ash 4–8 p. c. (K, Ca, Mg, carbonates and phosphates).

Ophelic Acid, $C_{13}H_{20}O_{10}$.—Bitter, syrupy liquid, soluble in water, alcohol, ether, not precipitated by tannin.

Chiratin, $C_{26}H_{48}O_{15}$.—Bitter glucoside, crystalline, yellow, hygroscopic, soluble in ether, alcohol, warm water, precipitated by tannin.

PREPARATIONS.—1. *Extractum Chiratæ Fluidum.* Fluid Extract of Chirata. (Syn., Fr. Extrait liquide de Chirette; Ger. Flüssiges Chiretta-Extrakt.)

FIG. 302.



Menyanthes trifoliata.

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

2. *Tinctura Chiratæ.* Tincture of Chirata. (Syn., Fr. Teinture de Chirette; Ger. Chirettatinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Prep.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES. — Tonic, febrifuge, stomachic, laxative; large doses nauseate. Good substitute for gentian, calumba and other bitters.

USES.—Liver troubles, costiveness, dyspepsia, debility, intermittents, bronchitis.

Allied Plants:

1. *S. angustifo'lia,* and *S. pulche'lla.*—Both have entire stems square, pith thin or wanting; less bitter than, and used to adulterate the official.

2. *Fra'sera carolinen'sis* (*Wal'teri*), *American Colombo.*—The root official, 1820–1880. United States. Perennial herb, 1–2.5 M. (3–8°) high, dark-purple stem 2.5–5 Cm. (1–2′) thick; leaves in whorls 4–6, entire, spatulate; flowers July, yellow, purple-dotted, large; root fusiform, fleshy, yellow. Usually in segments 2.5 Cm. (1′) thick, annulate, orange-brown; odor gentian-like; taste sweet, bitter; constituents and uses like gentian. Dose, gr. 15–30 (1–2 Gm.).

3. *Menyan'thes trifolia'ta, Water Shamrock, Buck* or *Bog-bean.*—Menyanthaceæ. The root (rhizome) official, 1820–1840. United States. Perennial herb, 2.5–3.7 M. (8–12°) high; root 12 Mm. (½′) thick, long, jointed, branching, black; contains menyanthin (glucoside, yields menyanthol), mucilage, albumin, saccharose, fat. Used as tonic,

febrifuge, emmenagogue, antiscorbutic, vermifuge; large doses emetic, purgative; rheumatism, scrofula, scurvy, dropsy, intermittents, jaundice, dyspepsia, worms. Dose, gr. 15–30 (1–2 Gm.).

71. APOCYNACEÆ. Dogbane Family.

A-pos-i-na′se-e. L. *Apocyn-um* + aceæ, fr. Gr. *ἀπό*, from, away, + *κύων*, a dog; *i. e.*, drives away or kills dogs, hence dogbane. Trees or shrubs. Distinguished by being milky, acrid, poisonous; leaves exstipulate, entire; calyx and corolla 5-lobed; from Asclepiadaceæ by stamens being free from style and stigma (insertion on the corolla), and granular pollen, filaments distinct; ovary 2, usually separate; fruit 2 follicles or drupes; tropics; purgative, tonic, febrifuge, poisonous.

Genera: 1. **Apocynum.** 2. **Strophanthus.** 3. **Aspidosperma.**

APOCYNUM. APOCYNUM (CANADIAN HEMP).

Apocynum cannabinum, *Linné.* } The root.

Habitat. United States, Canada to Florida, grassy places, fields, borders of woods.

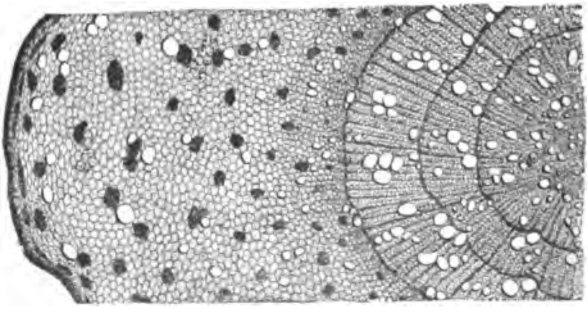
Syn. American (Black Indian) Hemp, Bowman's Root, Amy-root, Milk-weed, Rheumatism-weed, Wild Cotton, Indian Physic. Fr. Chanvre du Canada. Ger. Canadische Hanfwurzel.

A-poc′y-num. L. see etymology, above, of Apocynaceæ.

Can-nab′i-num. L. adj. form of *cannabis*, Gr. *κάνναβίς*, hemp, so called fr. Ar. name *ganah*, Celtic *can*, reed, + *ab*, small; *i. e.*, from strong fibres of stem-bark, resembling the bast-fibres of hemp.

PLANT.—Perennial, abounding in adhesive milky juice; stem purplish, 1 M. (3°) high, bark tough, fibrous; leaves mucronate; flowers July–Aug., numerous, greenish-white or reddish. ROOT, 1.5–2 M. (5–6°) long, 8 Mm. ($\frac{1}{3}$′) thick, brownish-gray, internally whitish, longitudinally wrinkled and transversely fissured; bark thick, containing many laticiferous vessels, by maceration furnishing a substitute for hemp, brittle, fracture short, wood porous, spongy, with delicate medullary rays; inodorous; taste bitter, disagreeable. The bitterness

FIG. 303.

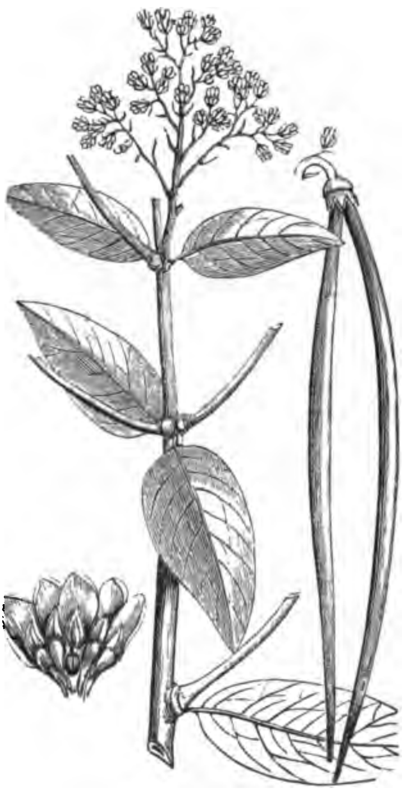


Apocynum cannabinum; transverse section, magnified 25 diam.

is in the bark, which constitutes 65 p. c. of the root. *Solvents:* boiling water; alcohol 65 p. c. Dose, antiperiodic, diuretic, gr. 2–5 (.13–.3 Gm.); emetic, gr. 15–30 (1–2 Gm.).

Commercial.—The root on the market is that collected from three or four good species, all having similar properties.

FIG. 304.



Apocynum cannabinum.

CONSTITUENTS.—Apocynin, Apocyneïn, tannin, resin, bitter extractive, starch, ash 11 p. c.

Apocynin.—This is resin-like, amorphous, yellowish-white, not a glucoside, soluble in alcohol, ether, insoluble in water. Dose, expectorant, gr. ¼–½ (.016–.03 Gm.).

Apocyneïn.—A yellowish glucoside, acts like digitalin, soluble only in alcohol or water.

PREPARATIONS.—1. *Extractum Apocyni Fluidum.* Fluid Extract of Apocynum. (Syn., Fluid Extract of Canadian Hemp; Fr. Extrait liquide de Chanvre du Canada; Ger. Flüssiges Canadisches Hanfwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., alcohol 65, water 25, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏ij–5—30 (.13–.3—2 Cc.).

Unoff. Preps.: Decoction, 5 p. c. (boiled to two-thirds). Dose, ℥ss–1 (15–30 Cc.). *Aqueous Extract.* Dose, gr. 1–4 (.06–.26 Gm.). *Tincture.*

PROPERTIES. — Emetic, cathartic, expectorant, alterative, diuretic, antiperiodic, diaphoretic, antisyphilitic, sudorific, cardiac stimulant.

USES.—Dropsy, dyspepsia, intermittents.

Allied Plants:

1. *A. androsæmifo'lium, Spreading Dogbane.*—The root official, 1820–1880. N. America. Grows with official plant, but has stem more spreading, leaves broader, root bark thinner, wood porous, rhizome with central pith, flowers pink; constituents and uses same as official.

STROPHANTHUS. STROPHANTHUS.

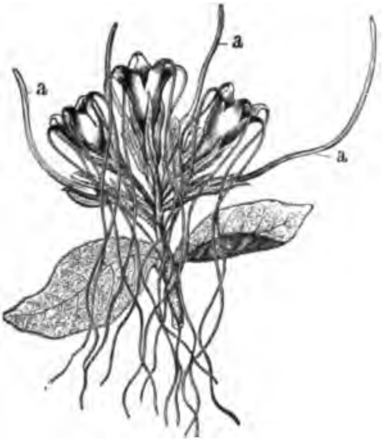
Strophanthus hispidus, *De Candolle.* } The seed, deprived of its long awn.

Habitat. Tropical Africa (Kombé, Guinea, Senegambia), Asia, Philippines.
Syn. Fr. Semence de Strophanthe; Ger. Semen Strophanthi, Strophanthussamen.

Stro-phan′thus. L. fr. Gr. *στροφή*, turning, to turn, twist, + *ἀνθος*, a flower; *i. e.*, from the twisted and tailed lobes of the corolla.
His′pi-dus. L. hairy, bristly; *i. e.*, seeds covered with long, coarse hairs.

PLANT.—Woody climber of forests, between the coasts and centre of the continent, reaches highest trees, hanging in festoons, and in coils upon the ground; stem emits milky juice and is several inches thick; flowers Oct.–Nov., cream-colored, yellow at base, purple-spotted above, cymes; corolla gamopetalous, lobes extended in narrow tail-like ends, 22.5–30 Cm. (9–12′) long; fruit June, pair of follicles, 20–37.5 Cm. (8–15′) long, each containing about 200 long awned seeds; collected by natives who peel off husks (epicarp and mesocarp), preserving and drying the more leathery inner covering (endocarp), which encloses the seed, as such being smooth, yellowish-brown. SEEDS, 15 Mm. ($\frac{5}{8}$′) long, 4 Mm. ($\frac{1}{8}$′) broad, oblong-lanceolate, flattened and obtusely edged, grayish-green, covered with deciduous, appressed, silky hairs, longitudinal ridge on one side, kernel white, oily, embryo straight, two cotyledons, surrounded with thin layer of perisperm; nearly inodorous; taste very bitter. Occur in market in pods or clean seeds. Of the fruit, seeds = 37 p. c., endocarp (pod) 37 p. c., hairs 25 p. c. The lighter in color the pappus the better their contained seeds. *Test:* Decoction (10 p. c.) is brownish, not changed by iodine T. S., nor ferric chloride, nor potassium mercuric iodide. *Solvents:* alcohol (65 p. c.); boiling water partially. Dose, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.008–.03 Gm.).

FIG. 305.



Strophanthus hispidus; a twig; a, a, a, budding branches.

CONSTITUENTS.—Strophanthin, Kombic acid, choline, trigonelline.

Strophanthin, $C_{38}H_{58}O_{15}$.—This bitter principle is obtained by exhausting the powdered seeds with (acidulated, HCl) alcohol, evaporating to soft extract, treating this with cold water, extracting aqueous mixture with chloroform to remove fat and oil; the aqueous portion now yields strophanthin in white shining crystals; when heated with diluted hydrochloric acid it is hydrolyzed, yielding no sugar, but strophanthidin, $C_{26}H_{38}O_7 + 1\frac{1}{2} H_2O$, in silky crystals. It is neutral, very bitter, soluble in water, alcohol, precipitated by tannin, colored green, then brown by sulphuric acid, blue by sulphuric acid + potassium dichromate. While the seeds yield most, the follicles and hairs contain some. Dose, gr. $\frac{1}{300}$–$\frac{1}{120}$ (.0002–.0005 Gm.).

Kombic Acid.—This is soluble in water and is precipitated by lead acetate.

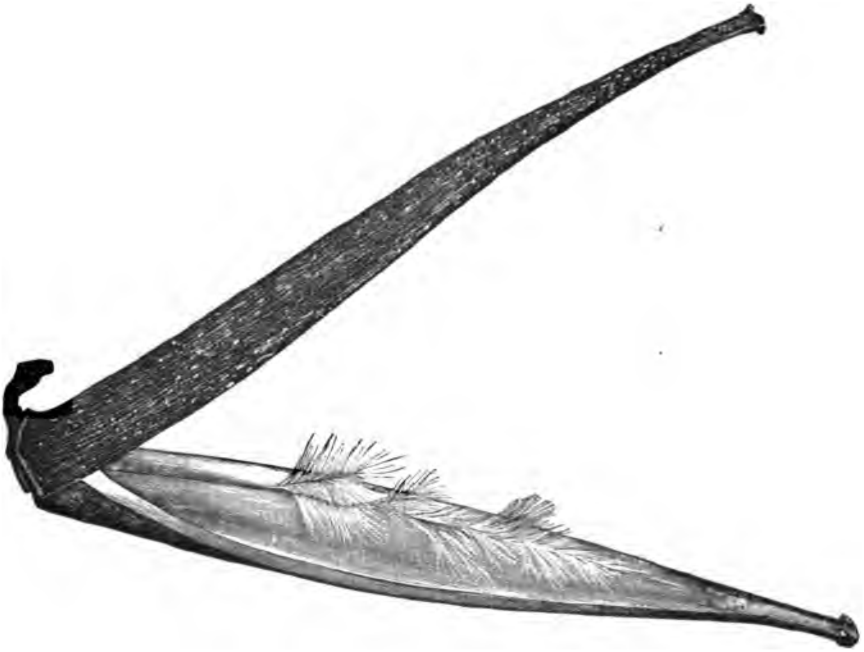
PREPARATIONS.—1. *Tinctura Strophanthi.* Tincture of Strophanthus. (Syn., Fr. Teinture de Semences de Strophanthe; Ger. Strophanthussamentinktur.)

Manufacture: 5 p. c. Macerate, percolate 5 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏j–10 (.06–.6 Cc.).

Unoff. Preps.: Extract. Dose, gr. $\frac{1}{48}$ (.0013 Gm.). *Decoction,* 1 p. c. Dose, ♏x–60 (.6–4 Cc.). *Test:* The tincture or extract + ferric chloride T. S. + sulphuric acid gives brown precipitate changing to green after one hour, and so remains 3–4 hours.

PROPERTIES.—Similar to digitalis; heart stimulant, diuretic. Acts directly on muscular tissue of the heart, increasing the contractile power. Small doses stimulate contractions, strengthen the force and lower the rate of heart beats, thus prolonging diastole without altering the duration of the systole making regular an irregular heart; large doses paralyze the heart, leaving cardiac muscle rigid. It is a better diuretic, and a more powerful cardiac stimulant than digitalis, the effect coming on much more quickly, yet being less permanent, reduces pulse and temperature, but is not cumulative, nor does it occasion gastro-intestinal troubles; the increased cardiac action stimulates renal circulation, hence is diuretic.

FIG. 306.



Strophanthus hispidus, capsule one-half natural size.

USES.—Cardiac dyspnœa, chronic Bright's, valvular heart lesions, palpitation, weak heart, pulmonary œdema from pneumonia, cardiac dropsy, endocarditis, hysteria, chlorosis, renal calculi, asthma, exophthalmic goitre. The effect is felt within half an hour, lasting 4–8 hours, reducing pulse 10–30 beats, at the same time increasing force and volume. The natives make of it an arrow poison (kombé), which is an extract for coating hunting arrows to about 15 Cm. (6′). Game, when wounded, soon becomes exhausted, but flesh is not injured by the poison.

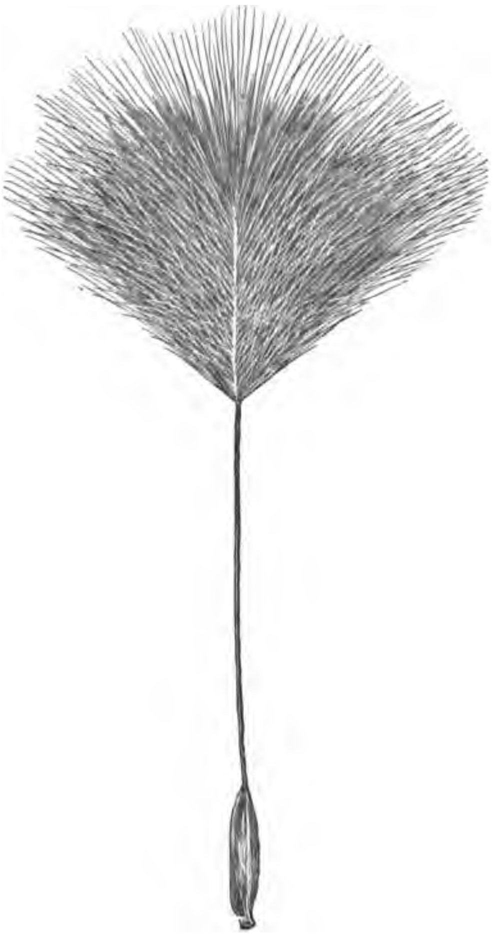
Poisoning, Incompatibles, Synergists: Same as in digitalis.

Allied Plants:

1. *S. dicho′tomus, False Strophanthus Seeds.*—These are chestnut-brown and less densely covered with hairs, otherwise resemble the official.

2. *S. Kombe′.*—This was once thought distinct and that from which arrow poison was made, but possibly the slight differences are simply due to soil, climate, etc.; *S. as′per*, seed covered with greenish-white hairs, larger than official; *S. gra′tus*, seed smooth, brown, fusiform, flat.

FIG. 307.



Strophanthus seed with comose awn.

ASPIDOSPERMA. ASPIDOSPERMA (QUEBRACHO).

Aspidosperma Quebracho-blanco, *Schlechtendal.* } The bark.

Habitat. S. America (Argentine Republic, Chili).

Syn. Quebracho Bark. Fr. Quebracho. Ger. Quebracho.

As-pi-do-sper′ma. L. fr. Gr. *ασπι(ς)δος*, a round shield, + *σπέρμα*, a seed, from the shape of the seed; *i. e.*, broadly winged.

Que-bra′cho-blan′co. Pg. contr. fr. *quebrar*, to break, + *hacha*, an ax, + *blanco*, white. The light-colored wood is so very hard as to break axes, etc.

PLANT.—Evergreen tree 24–30 M. (80–100°) high, wide spreading, drooping crown and branches, like the weeping willow; wood chocolate-brown, young yellowish; leaves small, entire, callous margin; flowers small, yellow. BARK, in flat or curved pieces 12–30 Mm. (½–1¼′) thick, outside yellowish-gray, deeply fissured, inner surface reddish-yellow, striate; fracture shows two strata of equal thickness—cork and bast layers; the former (outside) orange-brown, fracture granular with white dots in tangential lines; the latter (inside) brownish, fracture short-splintery; inodorous; bitter, aromatic. The bark must be taken from old trees in which corky layer is usually well developed. *Solvent:* diluted alcohol. Dose, gr. 15–30 (1–2 Gm.).

CONSTITUENTS.—Aspidospermine, $C_{22}H_{30}N_2O_2$, aspidospermatine, $C_{22}H_{28}N_2O_2$, aspidosamine, $C_{22}H_{28}N_2O_2$ (amorphous), quebrachine, $C_{21}H_{26}N_2O_2$, quebrachamine, hydroquebrachine, $C_{21}H_{26}N_2O_2$ (amorphous), quebrachit (a peculiar sugar), tannin 3–4 p. c.

Alkaloids (six).—These can be obtained by heating hot alcoholic extract with soda and chloroform, evaporating the latter solution, taking up residue with diluted sulphuric acid, filtering and precipitating with soda; now dissolve in boiling alcohol the precipitated alkaloids, cool, when aspidospermine, quebrachine, and quebrachamine will crystallize, being separated by crystallization from diluted hydrochloric acid—aspidospermine remaining in the (acid) mother-liquor. To the alcoholic mother-liquor add acetic acid and ammonia, thus getting aspidosamine, then add soda for aspidospermatine and hydroquebrachine, which precipitate treated with boiling benzin dissolves out the former. Aspidospermine, the leading alkaloid, occurs usually in commerce as a mixture, and is mostly prescribed as a salt—either sulphate or muriate. Dose, gr. 1–2 (.06–.13 Gm.). Quebrachine, the next most important alkaloid, also forms salts. Dose, gr. ¾–1½ (.05–.1 Gm.).

PREPARATIONS.—1. *Extractum Aspidospermatis Fluidum.* Fluid Extract of Aspidosperma. (Syn., Fluid Extract of Quebracho; Fr. Extrait liquide de Quebracho; Ger. Flüssiges Quebraco-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 10 Cc., alcohol 60, water 30, finishing with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏xv–30 (1–2 Cc.).

Unoff. Preps.: Tincture, 20 p. c. (diluted alcohol). Dose, ʒj–4 (4–15 Cc.). *Wine* (*Vinum*), 6 p. c. Dose, ʒj–6 (4–24 Cc.). *Extract.* Dose, gr. 2–8 (.13–.5 Gm.).

PROPERTIES.—Tonic, antispasmodic, antiperiodic, slows and deepens the breathing; solutions protective to wounds.

USES.—Cardiac and asthmatic dyspnœa, phthisis, asthma from bronchitis or chronic pneumonia, shortness of breath. Acts best when no organic lesion, hence on functional dyspnœa, by facilitating absorption of oxygen in the blood. If use continued, have headache, vertigo, salivation, intolerance, and death from asphyxia. It enables one to easily endure fatigue, climb elevations, etc. The bark is used also natively for tanning.

Allied Plants:

1. *Quebracho Colorado* (*Loxoptery'gium Lore'ntzii*).—S. America. Bark checkered; wood red or light-brown (*Colorado*); contains tannin 20 p. c., loxopterygine; resinous exudation of bark resembles kino.
2. *Quebracho flojo* (*Iodi'na rhombifo'lia*).—S. America.
3. *Copalchi Bark* (*Cro'ton ni'veus*).—Mexico. All these are sometimes collected and sold for the official drug.

RECAPITULATION NO. 8.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Umbelliferæ: 1. Fœniculum. 2. Fennel.	Fœniculum Fœniculum (capillaceum).	The fruit.	S. Europe, W. Asia.	Volatile oil, fixed oil, sugar, mucilage.	Comp. infus. senna, *Oil:* water, pulv. glycyr. co., spt. junip. co.	Carminative, stimulant, galactagogue.	Nausea, colic, amenorrhœa, flatulence, increases secretions.	10–30 (.6–2 Gm.)
1. Anisum. 2. Anise.	Pimpinella Anisum.	The fruit.	W. Asia, S. Europe.	Volatile oil, fixed oil, sugar, mucilage.	Tr. rhei dulc., *Oil:* water, spirit, spt. aurant. co., elix. phosph., syr. sars. co., tr. opii camph., troc. glycr. et opii.	Stimulant, carminative, stomachic, aromatic.	Colic, flatulence, bronchitis, catarrhs, flavoring.	10–30 (.6–2 Gm.)
1. Carum. 2. Caraway.	Carum Carvi (Carui).	The fruit.	C. and W. Asia.	Volatile oil, fixed oil, resin, sugar, mucilage, tannin.	Tr. card. co., *Oil:* spt. junip. co.	Stimulant, carminative, diuretic, stomachic.	Colic, flatulence, flavoring, toothache.	10–30 (.6–2 Gm.)
1. Coriandrum. 2. Coriander.	Coriandrum sativum.	The fruit.	C. Asia, S. Europe.	Volatile oil, tannin, malic acid, mucilage.	*Oil:* confec. senna, spt. aurant. co., syr. senna.	Aromatic, carminative, stimulant, stomachic.	Indigestion, flatulence, flavoring, rheumatism.	10–30 (.6–2 Gm.)
1. Conium. 2. Conium (Hemlock).	Conium maculatum.	The full grown fruit.	Europe, Asia, N. Africa.	Conine, methylconine, vol. oil, fixed oil, malic acid, conhydrine.	Extract, fld. extract.	Sedative, narcotic.	Chorea, mania, melancholy, tetanus, asthma, phthisis, etc.	1–5 (.06–.3 Gm.)
1. Asafœtida. 2. Asafetida.	Ferula fœtida.	The gum-resin.	Persia, Turkestan.	Gum, resin, volatile oil.	Emulsion, pill, tinct., pil. aloes et asafœtida.	Stimulant, antispasmodic, laxative, emmenagogue.	Hysteria, spasms, asthma, catarrhs, chorea, consumption, flatulence.	5–15 (.3–1 Gm.)
1. Sumbul. 2. Sumbul.	Ferula Sumbul.	The root.	C. and N. Asia.	Volatile oil, resin, angelic acid, valerianic acid.	Tincture.	Stimulant, tonic, nervine, antispasmodic.	Hysteria, epilepsy, chlorosis, amenorrhœa, delirium tremens.	10–30 (.6–2 Gm.)
1. Ammoniacum. 2. Ammoniac.	Dorema Ammoniacum.	The gum-resin.	E. Persia, Turkestan.	Gum, resin, volatile oil.	Emulsion, plaster of am. with mercury.	Stimulant, expectorant, rubefacient.	Bronchitis, catarrhs, asthma, pleurisy, ulcers, swollen glands.	10–30 (.6–2 Gm.)
Pyrolaceæ: 1. Chimaphila. 2. Chimaphila (Pipsissewa).	Chimaphila umbellata.	The leaves.	N. America.	Chimaphilin, arbutin, ericolin, urson, tannin, resin, sugar.	Fluid extract.	Astringent, tonic, diuretic, nephritic.	Scrofula, rheumatism, dropsy, gravel, diarrhœa.	15-60 (1-4 Gm.)
Ericaceæ: 1. Oleum Gaultheriæ. 2. Oil of Gaultheria (Oil of Wintergreen).	Gaultheria procumbens.	The volatile oil.	N. America.	Methyl salicylate, gaultherilene, benzoic ether.	Spt., syr. sars. co., tro. morph. et ipec., salicyl. acid, methyl salicylate.	Antiseptic, antipyretic, antiperiodic, stimulant, diuretic.	Rheumatism, migraine, sciatica, diabetes, cystitis, diphtheria, warts, corns.	Minims. 1–10 (.06–.6 Cc.)

1. Uva-Ursi. 2. Uva-Ursi (Bearberry).	Arctostaphylos Uva-Ursi.	The leaves.	Europe, Asia, N. America.	Tannin, gallic acid, arbutin, ericolin, urson.	Extract, fld. extr.	Astringent, diuretic, tonic, nephritic.	Cystitis, gravel, gleet, menorrhagia, bronchitis, diarrhœa.	Grains. 15-60 (1-4 Gm.)
Styracaceæ:								
1. Benzoinum. 2. Benzoin.	Styrax Benzoin.	The balsamic resin.	Sumatra, Java, Borneo, Siam.	Benzoic and cinnamic acids, resin, volatile oil, vanillin.	Benzoinated lard, tinct., tinct. benz. co., benzoic acid.	Stimulant, expectorant.	Laryngitis, diarrhœa, wounds, coryza, ulcers.	5-30 (.3-2 Gm.)
Oleaceæ:								
1. Oleum Olivæ. 2. Olive Oil.	Olea europæa.	The fixed oil.	Asia, S. Europe.	Olein, palmitin, arachin, stearin.	Soap, soap plaster, soap lin., cerate spermaceti, plasters of iron, Burgundy pitch, lead, oint. diachy.	Nutrient, laxative, demulcent, protective.	Constipation of infants, gall-stones, bruises, sprains, wounds, ascarides, lubrication.	Minims. 60-480 (4-30 Cc.)
1. Manna. 2. Manna.	Fraxinus Ornus.	The concrete saccharine exudation.	Mediterranean Basin.	Mannit, glucose, resin, fraxin, mucilage.	Infusion senna comp.	Laxative, demulcent, expectorant, cholagogue.	Piles, urinary irritation, to evacuate bowels of children, etc.	Grains. 60-480 (4-30 Gm.)
Loganiaceæ:								
1. Gelsemium. 2. Gelsemium (Yellow Jasmine).	Gelsemium sempervirens.	The rhizome and roots.	S. United States.	Volatile oil, gelsemine, gelseminine, gelsemic acid, resin, starch.	Fluid extract, tincture.	Nervine, sedative, antispasmodic, antiperiodic.	Rheumatism, neuralgia, intermittents, dysmenorrhœa, chorea, hysteria, epilepsy, tetanus.	2-10 (.13-.6 Gm.)
1. Spigelia. 2. Spigelia (Pinkroot).	Spigelia marylandica.	The rhizome and roots.	United States.	Volatile oil, resins, bitter principle, spigeline, tannin, fat.	Fluid extract.	Anthelmintic, toxic, mydriatic.	Round worms.	30-120 (2-8 Gm.)
1. Nux Vomica. 2. Nux Vomica.	Strychnos Nux-vomica.	The seed.	India, E. India Islands.	Strychnine, brucine, igasurine, igasuric acid, loganin, fat.	Extract, tincture, fluid extract, strychnine, strychnine sulph.	Spinal nervine, tonic, poisonous.	Atonic dyspep., nervousness, anæmia, paralysis, lead palsy, tetanus, chorea, epilepsy.	$\frac{1}{3}$-5 (.03-.3 Gm.)
Gentianaceæ:								
1. Gentiana. 2. Gentian.	Gentiana lutea.	The root.	C. and S. Europe.	Gentiopicrin, gentisin, gentianose, fixed oil, pectin.	Extract, fld. extr., tinct. gent. comp.	Tonic, bitter.	Increases digestion, amenorrhœa, dyspepsia, intermittents.	5-30 (.3-2 Gm.)
1. Chirata. 2. Chirata.	Swertia Chirayita (Chirata).	The entire plant.	N. India.	Ophelic acid, chiratin.	Fluid extract, tincture.	Tonic, febrifuge, stomachic, laxative.	Liver trouble, dyspepsia, debility, bronchitis, intermittents.	15-30 (1-2 Gm.)
Apocynaceæ:								
1. Apocynum. 2. Apocynum (Canadian Hemp).	Apocynum cannabinum.	The root.	N. America.	Apocynin, apocynein, tannin, resin, bitter extractive.	Fluid extract.	Emetic, cathartic, alterative, diuretic, antiperiodic.	Dropsy, dyspepsia, intermittents.	2-30 (.13-2 Gm.)
1. Strophanthus. 2. Strophanthus.	Strophanthus hispidus.	The seed.	Africa, Asia.	Strophanthin, kombic acid.	Tincture.	Heart sedative, diuretic.	Bright's disease, heart palpitation, endocarditis, asthma, dropsy.	$\frac{1}{8}$-$\frac{1}{2}$ (.008-.03 Gm.)
1. Aspidosperma. 2. Aspidosperma (Quebracho).	Aspidosperma Quebracho-blanco.	The bark.	S. America.	Aspidospermine, aspidospermatine, aspidosamine, quebrachine, tannin.	Fluid extract.	Tonic, antispasmodic, antiperiodic, protective.	Asthma, cardiac trouble, phthisis, dyspnœa.	15-30 (1-2 Gm.)

72. ASCLEPIADACEÆ. Milkweed Family.

As-kle-pi-a-da'se-e. L. *Asclepi-as(ad)* + aceæ, fr. Gr. 'Ἀσκληπιός, dedicated to Æsculapius, Asclepias, Latin tutelary god of medicine. Shrubs or trees. Distinguished by being milky, succulent, twining; anthers connected with stigma; filaments 5, monadelphous; pollen in wax-like masses on stigma appendages; flowers regular, calyx and corolla 5-cleft, latter deciduous, valvate; fruit, 2 follicles; tropics; stimulant, emetic, purgative, diaphoretic (bitter acrid juice), antidote to snake-bites; caoutchouc.

Genus: 1. **Asclepias.**

ASCLEPIAS. ASCLEPIAS (PLEURISY ROOT).

Asclepias tuberosa, *Linné.* } The root.

Habitat. United States, Canada to Florida, near Atlantic Coast, west, sandy fields.

Syn. Butterfly-weed, Silkweed, Wind-, Tuber-, White-, Orange-, Canada-, or Flux-root, Orange Swallow-wort. Fr. Racine d'Asclépiade tubereuse. Ger. Knollige Schwalbenwurzel.

As-cle'pi-as. L. see etymology, above, of Asclepiadaceæ.

Tu-be-ro'sa. L. *tuberosus*, full of lumps, protuberances; *i. e.*, the tuberous shape of the roots.

PLANT.—A perennial; stems numerous, 1 M. (3°) high, hairy, green or reddish, erect or procumbent; flowers June–July; beautiful orange-red. Most abundant southward; differs from all other *Asclepias* in not emitting a milky juice. ROOT, large, fusiform, in pieces 2.5–15 Cm. (1–6′) long, 2.5 Cm. (1′) thick, head knotty, annulate, yellowish-brown, but whitish within, becomes gray throughout by age, fracture tough, uneven, bark thin, in two layers, inner one whitish, wood with large white medullary rays; inodorous; taste bitter, acrid. Easily powdered when dry. *Solvents:* diluted alcohol; boiling water less effectively. Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Glucoside, two resins, mucilage, starch, tannin.

Glucoside.—Crystalline with taste of root, soluble in alcohol, ether, somewhat in water, precipitated by tannin.

PREPARATIONS.—1. *Extractum Asclepiadis Fluidum.* Fluid Extract of Asclepias. (Syn., Fluid Extract of Pleurisy Root; Fr. Extrait liquide de Racine d'Asclépiade tubereuse; Ger. Flüssiges Knollige Schwalbenwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Prep.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Diaphoretic, expectorant, carminative, sudorific, anodyne, irritant. Large doses emetic, cathartic.

USES.—Pleurisy (hence its name), pneumonia, consumption, rheumatism of chest, colic, dyspepsia, asthma, scrofula, ulcers, wounds.

Allied Plants:

1. *A. incarna'ta, Flesh-colored Asclepias, Swamp Milkweed.*—The

root (rhizome) official, 1820–1860 and 1870–1880. Canada, United States. Perennial herb, smooth or pubescent, .6–1 M. (2–3°) high, with two downy lines above; very leafy; leaves lanceolate, cordate base, 10–17.5 Cm. (4–7′) long, 2.5–5 Cm. (1–2′) wide; flowers rose-purple, sweet-scented; root 2.5 Cm. (1′) long, knotty, oblong, brownish, bark thin, central pith, sweet, acrid bitter, emits milky juice when wounded; contains volatile oil, 2 acrid resins, asclepiadin. Used as alterative, emetic, cathartic, diuretic, like the official; in decoction, infusion, tincture. Dose, gr. 15–40 (1–2.6 Gm.).

2. *A. syri′aca* (*Cornu′ti*), *Common Milkweed, Silkweed.*—The root (rhizome) official, 1820–1860 and 1870–1880. United States. Herb 1–1.5 M. (3–5°) high, stout, pubescent, finely soft; leaves oblong, 10–20 Cm. (4–8′) long, downy beneath; flowers large, purplish-white, sweet-scented, hoods ovate with a tooth each side of stout, claw-like horn; fruit prickly pods containing much silky seed-down; root 2.5–15 Cm. (1–6′) long, 6–12 Mm. (¼–½′) thick, in sections, wrinkled, knotty, brownish; bark tough, thick, with laticiferous vessels, wood-wedges yellow, bitter, nauseous. Contains asclepion (tasteless), bitter, crystalline principle, caoutchouc (6 p. c. of milk-juice), resin, tannin, starch. Used like preceding, also to coat over wounds, ulcers, etc., to promote cicatrization. Dose, gr. 15–40 (1–2.6 Gm.).

3. *A. curassa′vica, Bastard Ipecacuanha.*—C. and S. America. Flowers bright-red; the glossy seed-hairs, called vegetable silk, are firmer than the preceding. Contains asclepiadin, and is used natively like our official.

4. *Marsde′nia* (*Gono′lobus*) *Condura′ngo, Condurango.*—Ecuador. Climbing vine, 3–9 M. (10–30°) high, bark of the stem used in medicine; occurs in quills, or curved pieces, periderm ash-gray, wrinkled, warty, with greenish-black lichens attached; liber pale-brownish and striate, due to stone-cells; odor slight; taste bitter, acrid. Contains tannin, a glucoside, an alkaloid (resembling strychnine in action), resins, starch, gum, ash 12 p. c. Used for tonic, alterative, rheumatism, cancer. Dose, gr. 30 (2 Gm.).

73. CONVOLVULACEÆ. Morning-glory Family.

Kon-vol-vu-la′se-e. L. *Convolvul-us* + aceæ, fr. *convolvere*, to roll together, entwine; *i. e.*, referring to stem's twining habit. Herbs, shrubs. Distinguished by twining or trailing habit, roots containing acrid, milky, purgative juice; leaves exstipulate, sometimes parasitic and leafless; calyx 5, imbricate, inferior; corolla regular, 5-plaited or -lobed; ovary 2–4-celled; ovules 2 in each cell; fruit capsule, 2–4-celled. Allied to Solanaceæ and Scrophulariaceæ, but differing in habit, alternate leaves, and large solitary seeds, with crumpled embryo; tropics, temperate climates; purgative (glucosides in juices); some roots edible (starch, sugar).

Genera: 1. **Exogonium (Ipomœa).** 2. **Convolvulus.**

JALAPA. JALAP.

Exogonium purga, (*Wenderoth*) *Lindley.* } The tuberous root.
(**Ipomœa Jalapa,** *Nuttall.*) }

Habitat. E. Mexico, in damp, rich, shady woods; cultivated in India.

Syn. Vera Cruz Jalap, Radix Jalapæ. Fr. Jalap tubéreux, Jalap officinal. Ger. Tubera Jalapæ, Jalapenknollen, Jalape, Jalapenwurzel.

Ex-o-go′ni-um. L. fr. Gr. *ἔξω*, outside, + *γόνος*, offspring; *i. e.*, parts of generation (stamens, pistil) exserted—extend above corolla.

Pur′ga. L. fr. *purgo*, *purgare*, to purge, cleanse, purify; *i. e.*, its cathartic action on the system.

Ip-o-mœ′a. L. fr. Gr. *ἴψ*, *ἰπός*, a worm, bindweed, + *ὅμοιος*, like; *i. e.*, from its twining habit resembling the contortions of a worm.

Jal′a-pa. L. named after *Jalapa* or *Xalapa*, a city in Mexico, whence imported.

Jal′ap. Formerly *jal op*, English abbreviation from *Jalapa.*

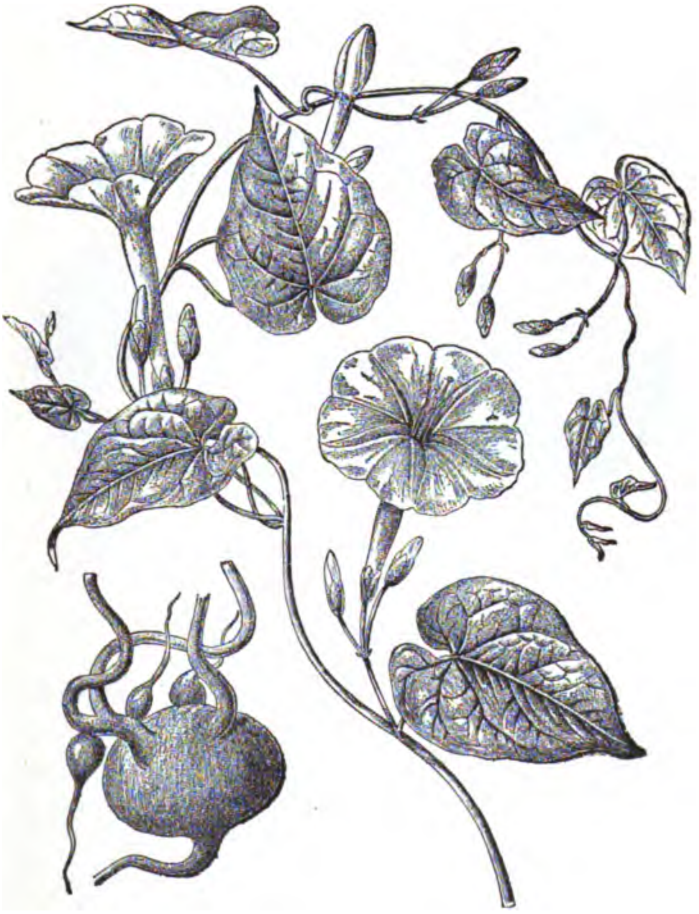
PLANT.—Perennial twining herb; stems numerous, slender, twisted, furrowed, smooth, purplish, 3.6–6 M. (12–20°) long, twining around neighboring objects; leaves exstipulate, 10–12.5 Cm. (4–5′) long, cordate, entire, smooth, pointed, under side paler, prominently veined, on long petioles; flowers Sept.–Nov., purple, salver-shaped, tube 5 Cm. (2′) long, limb 5–7.5 Cm. (2–3′) wide, in three-flowered cymes, stamens exserted (*exogonium*). ROOT, napiform, pyriform or oblong, 2.5–10 Cm. (1–4′) thick, large ones incised, wrinkled, dark-brown, with lighter spots and transverse ridges; hard, compact, inside grayish-brown, with numerous, concentric circles, composed of small resin-cells; fracture resinous, not fibrous; odor slight, peculiar, smoky, sweetish; taste sweetish, acrid. *Test:* On exhausting 100 parts with alcohol, concentrating to 40 parts, and pouring into water, the resulting dried resin should weigh not less than 12 parts, of which not over 10 p. c. should be soluble in ether. *Solvents:* diluted alcohol extracts the virtues completely; water or alcohol alone partially; each take out some purgative property, the alcoholic being more griping than the aqueous. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—1. The roots of allied species. 2. Jalap roots when immature, being collected at improper times (containing very little resin). 3. Jalap roots deprived of resin by soaking in alcohol; all such are sticky to the touch, darker internally, hence easily recognized. 4. Roots of many other species of *Exogonium* and *Ipomœa* genera; 5. Mealy jalap, resembling the true root, but has mealy fracture and very few resin-cells.

Commercial.—Plant grows on eastern slope of Mexican Andes, 1,500–2,400 M. (5,000–8,000°) elevation; it flourishes well in the Neilgherry Mountains, India, and is cultivated in Jamaica. The tubercles (roots) are dug all year round (hence the varying appearance and strength), but chiefly in the spring when the young shoots begin to appear, better in the fall, however, when aërial stems have decayed. They are now washed, put into nets, and dried by holding over fire, there being no sunshine, owing to so much wet weather; if very large they are divided, incised, before desiccation, into halves, quarters, or transversely. After drying they are put into large bags (100–200 lbs.; 45–90 Kg.), and shipped from Vera Cruz.

CONSTITUENTS.—Resin 7–15–22 p. c., starch, gum, sugar, coloring matter.

FIG. 308.



Exogonium purga (Ipomœa Jalapa).

Resin.—Consists of: 1. *Jalapin* (probably identical with scammonin), 10 p. c.; soft, waxy, soluble in ether or potassa, and reprecipitated by acids. 2. *Jalapurgin* or *convolvulin*, $C_{62}H_{100}O_{32}$, 90 p. c., a glucoside, insoluble in ether, soluble in alkalies (potassa), more of an irritant than jalapin, and the most active constituent; converted into jalapurgic (convolvul(in)ic acid, which is soluble in water), $C_{28}H_{52}O_{14}$, and volatile methyl-ethyl-acetic acid, $C_5H_{10}O_2$.

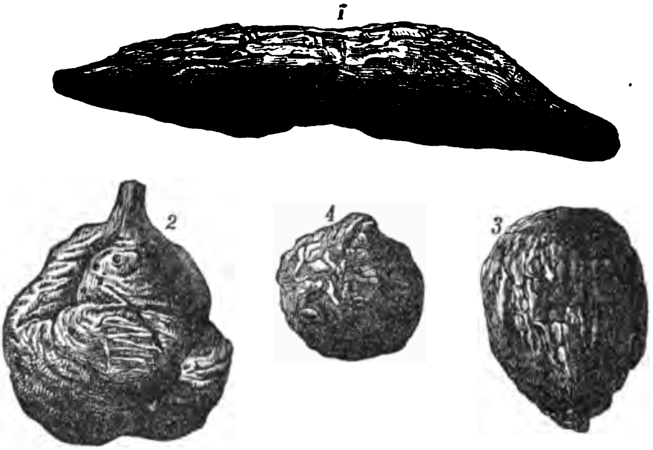
PREPARATIONS.—1. *Extractum Jalapæ.* Extract of Jalap. (Syn., Fr. Extrait de Jalap; Ger. Jalapen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. Dose, gr. 2–10 (.13–.6 Gm.).

Preps.: 1. *Pilulæ Catharticæ Compositæ*, gr. ½ (.03 Gm.) in each pill. Dose, 1–3 pills.

2. *Pilulæ Catharticæ Vegetabiles*, gr. ½ (.03 Gm.) in each pill. Dose, 1–3 pills.

FIG. 309.



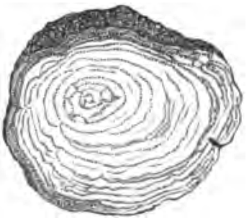
Jalap tubers, small-sized; 1, fusiform; 2, pear shape; 3, date shape; 4, globular.

2. *Pulvis Jalapæ Compositus.* Compound Powder of Jalap. (Syn., Pulvis Purgans—Catharticus or Jalapæ tartaratus; Fr. Poudre de Jalap composée; Ger. Jalapenpulver mit Weinstein.)

Manufacture: 35 p. c. Mix thoroughly 35 Gm. with potassium bitartrate 65 Gm. Dose, gr. 15–60 (1–4 Gm.).

3. *Resina Jalapæ.* Resin of Jalap. (Syn., Br. Jalapæ Resina; Fr. Résine de Jalap; Ger. Jalapenharz.)

FIG. 310.



Jalap tuber; transverse section.

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 250 Cc., distil off alcohol 200 Cc., throw residue into water 900 Cc. to precipitate resin, which wash and dry. Occurs in yellowish-brown masses or powder, peculiar odor, acrid taste, soluble in alcohol; 7 p. c. soluble in chloroform; 10 p. c. only soluble in ether; if this ethereal portion be evaporated and residue (jalapin) be dissolved in potassa T. S., will get reprecipitation by acids; the portion not soluble in ether (jalapurgin) when dissolved in potassa T. S. will not be precipitated by acids. *Impurities:* This resin may contain as impurities, water, soluble substances, common resin (soluble in oil of turpentine), guaiac (green color with few drops of alcohol and ferric chloride T. S.), aloes (very bitter, non-acrid). Dose, gr. 1–5 (.06–.3 Gm.).

Unoff. Preps.: Fluid Extract. Dose, ♏ij–10 (.13–.6 Cc.). *Abstract.* Dose, gr. 2–5 (.13–.3 Gm.). *Tincture,* 10 p. c. Dose, ʒj–2 (4–8 Cc.).

PROPERTIES.—Hydragogue cathartic, diuretic. Has no effect until the duodenum is reached, where with the bile it forms a purgative compound that stimulates vascularity, peristalsis and profuse secretion from intestinal glands, with no action on biliary flow; usually acts in four hours. It is less irritating, than gamboge, podophyllum or scammony, but occasionally gripes, nauseates and vomits. Often given to children for worms, as it has little taste and a safe action. Excessive doses produce dangerous hypercatharsis. Jalapurgin (convolvulin) in large doses is likewise an active irritant or poison.

USES.—Dropsy, constipation, in febrile and inflammatory affections, head troubles; was introduced into Europe early in the seventeenth century, and is even now quite popular, being usually associated with calomel, cream of tartar, etc.

Allied Plants:

1. *Ipomœa pandura'ta* (*Convo'lvulus pandura'tus*), *Wild Potato* or *Jalap, Man Root, Man of the Earth.*—The root official, 1820–1860. United States. Plant recognized by its fiddle-shaped leaves, stem purplish, climbing 3.5–4.5 M. (12–15°) high; flowers campanulate, white, purplish; root conical, .6–1 M. (2–3°) long, 5–7.5 Cm. (2–3′) thick, in slices, wrinkled, brownish-yellow, milky inside, bark thin with a zone of resin-cells, odor slight, taste sweetish, bitter, acrid. Contains resin 1–2 p. c. (glucoside). Used as diuretic, cathartic in strangury, calculi. Dose, gr. 15–60 (1–4 Gm.).

False Jalaps.

1. *I. si'mulans, Tampico Jalap.*—Root irregularly globular, or elongated, deeply wrinkled, no transverse ridges; yields resin (tampicin) 10–15 p. c., very similar to jalap resin, nearly all soluble in ether.

2. *I. orizabe'nsis, Fusiform* or *Male Jalap.*—Root spindle-shaped, .6 M. (2°) long, large, woody, often cut into pieces 5–7.5 Cm. (2–3′) broad, its resin (jalapin or orizabin) entirely soluble in ether. It is very unfortunate that the resin of this plant received the name *jalapin* primarily, as it thus precludes in a sense its application to the resin of the official drug. The synonym *orizabin* as proposed and named by Flückiger, may sometime be accepted here and thus allow the term *jalapin* to be used elsewhere.

3. *Convo'lvulus Mechoaca'nna, Mechoacanna Root.*—Considered by some identical with *Ipomœa pandurata;* occurs in sections, light, whitish, mealy, contains little resin.

SCAMMONIUM. SCAMMONY.

Convolvulus Scammonia, *Linné.* } A resinous exudation, from the living root.

Habitat. W. Asia (Syria, Asia Minor, Anatolia), Greece, Archipelago, cultivated.
Syn. Scammony Virgin, Aleppo Scammony. Fr. Scammonée. Ger. Scammonium.
Con-vol'vu-lus. L. bindweed, see etymology, page 465, of Convolvulaceæ.
Scam-mo'ni-a. L. fr. Gr. *σκάμβος*, crooked; *i. e.*, its stems are crooked, *σκαμμωνία*, classic name, Pers. origin.

PLANT.—Perennial herb, root long, perpendicular, straight, tapering, woody, unbranched, 1–1.3 M. (3–4°) long, 2.5–10 Cm. (1–4′) thick, smooth, yellowish, paler within; containing 5 p. c. milky juice; stems numerous, from crown of root, slender, 6–9 M. (20–30°) long, twining; leaves arrow-shaped, petioles long, bright-green; flowers July–Sept.; large, many, on long stalks, funnel-shaped, 4–5 Cm. (1½–2′) wide, pale-yellow; fruit ovate capsule 12 Mm. (½′) long, 4-seeded. RESIN (scammony), in irregular, angular pieces or circular cakes, greenish-gray, porous, fracture angular, resinous lustre; odor peculiar, cheese-like; taste acrid, powder grayish, triturated with water yields greenish emulsion. *Tests:* 1. No effervescence with dilute hydrochloric acid; cold decoction is not blue with iodine T. S. (abs. calcium carbonate, starch). 2. Ether dissolves at least 75 p. c. and residue, after evaporating ether, dissolved in hot potassa solution is not precipitated by diluted sulphuric acid. *Solvents:* boiling alcohol dissolves most of it. Dose, gr. 1–5–10 (.06–.3–.6 Gm.).

ADULTERATIONS.—Calcium carbonate, wheat flour, starch, ashes, sand, tragacanth, powdered scammony root, resin, gypsum, black-lead, etc., all these insoluble in ether, hence by amount of ether residue can easily recognize the extent of impurities.

Commercial.—Scammony is collected June–Aug., when plant is in flower, by removing upper earth from top of root 7.5–12.5 Cm. (3–5′) deep, and cutting a slanting cross-section two inches (5 Cm.) below the crown, with a sickle knife, whereupon the juice at once exudes, being caught in mussel shells stuck in the root below; this pure resin when dry is gummy-looking, golden-yellow color, and each plant yields about ʒj (4 Gm.). The shells are collected at evening and the plastic tears scraped from cut surface of the root; this latter has a creamy consistence (*kaimak*), that in shells milky (*gala*). As thus obtained we have the purest variety: 1. *Genuine Scammony, Scammony in Shells.* This is, however, usually before reaching market, kneaded with water or expressed juice of leaves, stalks or roots, then quickly dried, and thus furnishes an inferior grade: 2. *Virgin Scammony.* Formerly *Aleppo,* was known as superior and *Smyrna* as inferior, while now the converse is often true, so that the only safe recognition of quality turns upon the percentage yield of resin. 3. *Montpellier* or *Factitious Scammony.* This is the milky juice of *Cyna'nchum acu'tum* (*monspelia'cum*), used somewhat in France, contains resin 10–20 p. c., and is sometimes imported as Smyrna. The *virgin* as prepared (consisting of daily collections until aggregating a pound (.5 Kg.) or more) consumes a long time, during which it slowly dries, allowing fermentation to take place, and thus renders the product porous, dark and of a cheesy odor; the *genuine,* on the other hand, is apt to become mouldy and covered with white crystalline efflorescence; to avoid this must keep dry. Enters market via Smyrna.

CONSTITUENTS.—Resin (scammonin) 75–90 p. c., gum 3–8 p. c., ash 3–8 p. c.

Resin, $C_{34}H_{56}O_{16}$.—Identical with orizabin (jalapin) of *Ipomœa ori-*

zabe'nsis ; by alkalies converted into scammonic acid which is soluble in water.

PREPARATIONS.—1. *Resina Scammonii.* Resin of Scammony. (Syn., Scammonin; Br. Scammoniæ Resina; Fr. Résine de Scammonée; Ger. Scammoniaharz.)

Manufacture : Digest 100 Gm., with successive portions of boiling alcohol until exhausted, distil off alcohol, and add syrupy residue to water 250 Cc. to precipitate resin, wash, dry. In yellowish-brown masses, glossy, resinous fracture, powder grayish, peculiar odor and taste; soluble in alcohol, ether, benzene, oil of turpentine, hot alkaline solutions (from latter not precipitated by acids). *Tests :* 1. Sulphuric acid acts upon it slowly (quickly turns common resin deep-red). 2. Does not yield green emulsion with water (abs. scammony). Dose, gr. 3–8 (.2–.5 Gm.).

Prep. : 1. *Extractum Colocynthidis Compositum,* 14 p. c. (resin). Dose, gr. 5–15 (.3–1 Gm.).

Unoff. Prep. : Emulsion. In pill form it is usually inactive.

PROPERTIES.—Hydragogue, cholagogue cathartic; only acts locally on the upper intestine, consequently resembles jalap, but is a more active irritant, causing much griping, owing to which it is generally associated with potassium sulphate, calomel, colocynth, jalap, aromatics, demulcents, etc.

USES.—Dropsies, cerebral affections, torpid intestines with slimy mucus. It is somewhat uncertain, owing to frequent impurities and difficult solubility in the system; at the same time, owing to small dose and little taste, it is very good for children, but at all times calomel, jalap or gamboge are to be preferred. It was known to the Greeks, Romans, Arabians as a purgative, cure for skin diseases and as a fatal irritant.

74. HYDROPHYLLACEÆ. Waterleaf Family.

Hi-dro-fi-la'se-e. L. *Hydrophyll-um* + aceæ, fr. Gr. ὕδωρ, water, + φύλλον, L. *folium,* a leaf; *i. e.,* each leaf has a cavity for holding water. Herbs, shrubs, small trees. Distinguished by being hairy, juicy; leaves hairy, toothed, lobed, pinnately compound; flowers regular, scorpioidal, 5's; ovary 1–2-celled, 2 parietal placentas, styles and stigmas 2; ovules 2–many; fruit, capsule, 2-valved; temperate climates; stimulant, astringent.

Genus: 1. **Eriodictyon.**

ERIODICTYON. ERIODICTYON.

Eriodictyon californicum, (*Hooker & Arnott*) *Greene.* } The leaves.
(**Eriodictyon glutinosum,** *Bentham.*) }

Habitat. California, Northern Mexico; dry hills, mountains.

Syn. Yerba Santa, Bear's Weed, Consumptive's or Tar Weed, Mountain Balm, Gum Plant.

Er-i-o-dic'ty-on. L. fr. Gr. ἔριον, wool, + δίκτυον, a net; *i. e.,* woolly, net-veined leaves.

RECAPITULATION No. 8.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Umbelliferæ:								
1. Fœniculum. 2. Fennel.	Fœniculum Fœniculum (capillaceum).	The fruit.	S. Europe, W. Asia.	Volatile oil, fixed oil, sugar, mucilage.	Comp. infus. senna, *Oil:* water, pulv. glycyr. co., spt. junip. co.	Carminative, stimulant, galactagogue.	Nausea, colic, amenorrhœa, flatulence, increases secretions.	10–30 (.6–2 Gm.)
1. Anisum. 2. Anise.	Pimpinella Anisum.	The fruit.	W. Asia, S. Europe.	Volatile oil, fixed oil, sugar, mucilage.	Tr. rhei dulc., *Oil:* water, spirit, spt. aurant. co., elix. phosph., syr. sars. co., tr. opii camph., troc. glycr. et opii.	Stimulant, carminative, stomachic, aromatic.	Colic, flatulence, bronchitis, catarrhs, flavoring.	10–30 (.6–2 Gm.)
1. Carum. 2. Caraway.	Carum Carvi (Carui).	The fruit.	C. and W. Asia.	Volatile oil, fixed oil, resin, sugar, mucilage, tannin.	Tr. card. co., *Oil:* spt. junip. co.	Stimulant, carminative, diuretic, stomachic.	Colic, flatulence, flavoring, toothache.	10–30 (.6–2 Gm.)
1. Coriandrum. 2. Coriander.	Coriandrum sativum.	The fruit.	C. Asia, S. Europe.	Volatile oil, tannin, malic acid, mucilage.	*Oil:* confec. senna, spt. aurant. co., syr. senna.	Aromatic, carminative, stimulant, stomachic.	Indigestion, flatulence, flavoring, rheumatism.	10–30 (.6–2 Gm.)
1. Conium. 2. Conium (Hemlock).	Conium maculatum.	The full grown fruit.	Europe, Asia, N. Africa.	Conine, methylconine, vol. oil, fixed oil, malic acid, conhydrine.	Extract, fld. extract.	Sedative, narcotic.	Chorea, mania, melancholy, tetanus, asthma, phthisis, etc.	1–5 (.06–.3 Gm.)
1. Asafœtida. 2. Asafetida.	Ferula fœtida.	The gum-resin.	Persia, Turkestan.	Gum, resin, volatile oil.	Emulsion, pill, tinct., pil. aloes et asafœtida.	Stimulant, antispasmodic, laxative, emmenagogue.	Hysteria, spasms, asthma, catarrhs, chorea, consumption, flatulence.	5–15 (.3–1 Gm.)
1. Sumbul. 2. Sumbul.	Ferula Sumbul.	The root.	C. and N. Asia.	Volatile oil, resin, angelic acid, valerianic acid.	Tincture.	Stimulant, tonic, nervine, antispasmodic.	Hysteria, epilepsy, chlorosis, amenorrhœa, delirium tremens.	10–30 (.6–2 Gm.)
1. Ammoniacum. 2. Ammoniac.	Dorema Ammoniacum.	The gum-resin.	E. Persia, Turkestan.	Gum, resin, volatile oil.	Emulsion, plaster of am. with mercury.	Stimulant, expectorant, rubefacient.	Bronchitis, catarrhs, asthma, pleurisy, ulcers, swollen glands.	10–30 (.6–2 Gm.)
Pyrolaceæ:								
1. Chimaphila. 2. Chimaphila (Pipsissewa).	Chimaphila umbellata.	The leaves.	N. America.	Chimaphilin, arbutin, ericolin, urson, tannin, resin, sugar.	Fluid extract.	Astringent, tonic, diuretic, nephritic.	Scrofula, rheumatism, dropsy, gravel, diarrhœa.	15-60 (1-4 Gm.)
Ericaceæ:								
1. Oleum Gaultheriæ. 2. Oil of Gaultheria (Oil of Wintergreen).	Gaultheria procumbens.	The volatile oil.	N. America.	Methyl salicylate, gaultherilene, benzoic ether.	Spt., syr. sars. co., tro. morph. et ipec., salicyl. acid, methyl salicylate.	Antiseptic, antipyretic, antiperiodic, stimulant, diuretic.	Rheumatism, migraine, sciatica, diabetes, cystitis, diphtheria, warts, corns.	Minims. 1–10 (.06–.6 Cc.)

1. Uva-Ursi. 2. Uva-Ursi (Bearberry).	Arctostaphylos Uva-Ursi.	The leaves.	Europe, Asia, N. America.	Tannin, gallic acid, arbutin, ericolin, urson.	Extract, fld. extr.	Astringent, diuretic, tonic, nephritic.	Cystitis, gravel, gleet, menorrhagia, bronchitis, diarrhœa.	Grains. 15-60 (1-4 Gm.)
Styracaceæ :								
1. Benzoinum. 2. Benzoin.	Styrax Benzoin.	The balsamic resin.	Sumatra, Java, Borneo, Siam.	Benzoic and cinnamic acids, resin, volatile oil, vanillin.	Benzoinated lard, tinct., tinct. benz. co., benzoic acid.	Stimulant, expectorant.	Laryngitis, diarrhœa, wounds, coryza, ulcers.	5-30 (.3-2 Gm.)
Oleaceæ :								
1. Oleum Olivæ. 2. Olive Oil.	Olea europæa.	The fixed oil.	Asia, S. Europe.	Olein, palmitin, arachin, stearin.	Soap, soap plaster, soap lin., cerate spermaceti, plasters of iron, Burgundy pitch, lead, oint. diachy.	Nutrient, laxative, demulcent, protective.	Constipation of infants, gall-stones, bruises, sprains, wounds, ascarides, lubrication.	Minims. 60-480 (4-30 Cc.)
1. Manna. 2. Manna.	Fraxinus Ornus.	The concrete saccharine exudation.	Mediterranean Basin.	Mannit, glucose, resin, fraxin, mucilage.	Infusion senna comp.	Laxative, demulcent, expectorant, cholagogue.	Piles, urinary irritation, to evacuate bowels of children, etc.	Grains. 60-480 (4-30 Gm.)
Loganiaceæ :								
1. Gelsemium. 2. Gelsemium (Yellow Jasmine).	Gelsemium sempervirens.	The rhizome and roots.	S. United States.	Volatile oil, gelsemine, gelseminine, gelsemic acid, resin, starch.	Fluid extract, tincture.	Nervine, sedative, antispasmodic, antiperiodic.	Rheumatism, neuralgia, intermittents, dysmenorrhœa, chorea, hysteria, epilepsy, tetanus.	2-10 (.13-.6 Gm.)
1. Spigelia. 2. Spigelia (Pinkroot).	Spigelia marylandica.	The rhizome and roots.	United States.	Volatile oil, resins, bitter principle, spigeline, tannin, fat.	Fluid extract.	Anthelmintic, toxic, mydriatic.	Round worms.	30-120 (2-8 Gm.)
1. Nux Vomica. 2. Nux Vomica.	Strychnos Nux-vomica.	The seed.	India, E. India Islands.	Strychnine, brucine, igasurine, igasuric acid, loganin, fat.	Extract, tincture, fluid extract, strychnine, strychnine sulph.	Spinal nervine, tonic, poisonous.	Atonic dyspep., nervousness, anæmia, paralysis, lead palsy, tetanus, chorea, epilepsy.	½-5 (.03-.3 Gm.)
Gentianaceæ :								
1. Gentiana. 2. Gentian.	Gentiana lutea.	The root.	C. and S. Europe.	Gentiopicrin, gentisin, gentianose, fixed oil, pectin.	Extract, fld. extr., tinct. gent. comp.	Tonic, bitter.	Increases digestion, amenorrhœa, dyspepsia, intermittents.	5-30 (.3-2 Gm.)
1. Chirata. 2. Chirata.	Swertia Chirayita (Chirata).	The entire plant.	N. India.	Ophelic acid, chiratin.	Fluid extract, tincture.	Tonic, febrifuge, stomachic, laxative.	Liver trouble, dyspepsia, debility, bronchitis, intermittents.	15-30 (1-2 Gm.)
Apocynaceæ :								
1. Apocynum. 2. Apocynum (Canadian Hemp).	Apocynum cannabinum.	The root.	N. America.	Apocynin, apocynein, tannin, resin, bitter extractive.	Fluid extract.	Emetic, cathartic, alterative, diuretic, antiperiodic.	Dropsy, dyspepsia, intermittents.	2-30 (.13-2 Gm.)
1. Strophanthus. 2. Strophanthus.	Strophanthus hispidus.	The seed.	Africa, Asia.	Strophanthin, kombic acid.	Tincture.	Heart sedative, diuretic.	Bright's disease, heart palpitation, endocarditis, asthma, dropsy.	⅛-½ (.008-.03 Gm.)
1. Aspidosperma. 2. Aspidosperma (Quebracho).	Aspidosperma Quebracho-blanco.	The bark.	S. America.	Aspidospermine, aspidospermatine, aspidosamine, quebrachine, tannin.	Fluid extract.	Tonic, antispasmodic, antiperiodic, protective.	Asthma, cardiac trouble, phthisis, dyspnœa.	15-30 (1-2 Gm.)

proximate principle, as it is obtained by throwing the concentrated alcoholic tincture into water to which alum has been added, then washing and drying the precipitate.

PREPARATIONS.—1. *Extractum Scutellariæ Fluidum.* Fluid Extract of Scutellaria. (Syn., Fluid Extract of Skullcap; Fr. Extrait liquide de Scutellaire; Ger. Flüssiges Helmkraut-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Decoction. Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 5–10 (.3–.6 Gm.).

PROPERTIES.—Tonic, nervine, antispasmodic.

USES.—Epilepsy, hysteria, nervous exhaustion, chorea, delirium tremens, tremors, spasms, twitching of muscles, hyperæsthesia, neuralgia, convulsions, intermittents; incontinence of urine, hydrophobia.

Allied Plants:

1. *S. integrifo'lia* (plant hairy, racemes terminal). *S. pilo'sa* (plant hairy, racemes terminal, leaves in distant pairs), and *S. galericula'ta* (plant nearly smooth, flowers axillary, single). All used like official drug.

MARRUBIUM. MARRUBIUM (HOREHOUND).

Marrubium vulgare, *Linné.* } The leaves and tops.

Habitat. Europe, C. Asia. Naturalized in N. America; Cultivated in waste places, gardens, etc.

Syn. White Hoarhound, Houndbene, Marrube, Marvel, Herba Marrubii. Fr. (Herbe de) Marrube blanc. Ger. Andornkraut, Weisser Andorn.

Mar-ru'bi-um. L. (Pliny) fr. Heb. *marrob*, bitter juice; *i. e.*, the plant's extreme bitterness.

Vul-ga're. L. *vulgaris*, common, ordinary; *i. e.*, kind growing wild, and in general use, not cultivated.

Hore'hound. OE. *horehune*, AS. *harhune; har*, hoar, gray, + *hune*, horehound = gray horehound, stem and branches covered with white felt.

PLANT.—Perennial herb with short rootstock; stems numerous, annual, .3–.5 M. (12–18′) high, branched below, bluntly quadrangular, tomentose with cottony felt. LEAVES, 2.5 Cm. (1′) long, opposite, petiolate, roundish-ovate, obtuse, crenate, rugose, downy above, white-hairy beneath; flowers June–Sept., in dense axillary, woolly whorls, with a stiff, 10-toothed calyx, whitish, bilabiate corolla, 4 included stamens, aromatic, bitter. *Solvents:* diluted alcohol, boiling water. Dose, ʒss–1 (2–4 Gm.).

CONSTITUENTS.—Volatile oil, Marrubiin, resin, tannin, fat, wax, sugar, gum, albumin, salts.

Marrubiin.—Bitter glucoside, crystallizing from alcohol in prisms, from ether in tabular crystals, not precipitated by tannin, bitter acrid taste; obtained by treating aqueous extract with alcohol, distilling, shaking residue with ether; or can agitate infusion with charcoal and exhaust this with hot alcohol, which dissolves marrubiin and tannin, precipitate latter with lead oxide.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ʒss–1 (2–4 Cc.).

Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Juice* (*Succus Marrubii*). Dose, ʒj–2 (4–8 Cc.) given with honey or milk. *Extract.* Dose, gr. 5–10 (.3–.6 Gm.).

Properties.—Stimulant, tonic, bitter stomachic, resolvent, deobstruent, anthelmintic. Large doses diuretic, diaphoretic, laxative.

Uses.—Dyspepsia, bronchitis, chronic hepatitis, jaundice, amenorrhœa, phthisis, cachectic affections, catarrh, chronic rheumatism, intermittents. The infusion can be sweetened or flavored as to liking; owing to its bitterness, the lozenges or cough drops, are the most popular form of administration.

Allied Plants:

1. *Ne'peta Cata'ria*, *Catnep*, *Catnip*, *Catmint.*—The leaves and tops official, 1840–1880. Asia, Europe. Perennial herb; stem quadrangular, branching, hoary, pubescent, .6–1 M. (2–3°) high, leaves 5 Cm. (2′) long, triangular, ovate, cordate, serrate, hairy, flowers whitish or pale-pink, dotted with lilac, calyx 5-toothed, 2-lipped, stamens 4, didynamous, odor mint-like, bitter, aromatic, camphoraceous, pungent, contains volatile oil, bitter principle, tannin. Used as carminative, stimulant, tonic, diaphoretic, emmenagogue, antispasmodic for hysteria, chlorosis, colic, amenorrhœa, toothache; in infusion, decoction. Dose, gr. 15–60 (1–4 Gm.). Cats eat it ravenously, being fond of it from the aphrodisiac effect.

2. *Prune'lle* (*Brune'lla*) *vulga'ris*, *Self-heal*, *Heal-all.*—Plant .3 M. (1°) high, flowers purplish-blue, in dense spike, leaves hairy, bitter, astringent.

SALVIA. SALVIA (Sage).

Salvia officinalis, *Linné.* } The leaves.

Habitat. S. Europe, warm stony places; cultivated in England, France, Germany, Spain, Italy, Greece, United States, in gardens.

Syn. Garden Sage, Meadow Sage of Europe. Fr. Sauge officinale, Sauge. Ger. Folia (Herba) Salviæ, Salbeiblätter, Salbei.

Sal'vi-a. L. fr. *salvo*, *salvare*, to save; *i. e.*, its supposed healing properties.

Of-fi-ci-na'lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

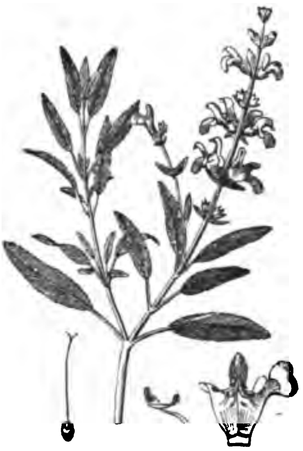
Sage. OE. *sauge*, L. *salvia*, *salvus*, saved; *i. e.*, its healing virtues.

Plant.—Perennial; stem semi-shrubby, .6 M. (2°) high, quadrangular, pubescent, much branched; flowers June, large, on woolly stalks, blue variegated with white and purple, cymes, calyx tubular, striated, 2 lips, upper with 3, the lower 2 acute teeth; corolla tubular, bilabiate, lower in 3 rounded lobes, middle one the largest; fruit 4 achenes, seed solitary. Leaves, 5 Cm. (2′) long, petiolate, ovate-oblong, subacute at apex, rounded or heart-shaped at base, finely crenulate, thickish, wrinkled, grayish-green, soft-hairy and glandular beneath; odor aromatic; taste aromatic, bitterish, astringent. Should be collected while flowering and dried in the shade. *Solvents:* diluted alcohol; boiling water. Dose, gr. 15–60 (1–4 Gm.).

Constituents.—Volatile oil ½–¾ p. c., resin, tannin, albumin.

Volatile Oil.—Obtained by distillation with water or steam, is greenish or yellowish, sp. gr. 0.920, soluble in alcohol (80 p. c.), dextrogyrate. Composed of terpene—pinene, $C_{10}H_{16}$, cineol, $C_{10}H_{18}O$, as the first and lesser portion, and salviol (thujone), $C_{10}H_{16}O$, as the greater portion; in fresh oil the converse is true, terpenes predominate, and by age salviol increases, thus developing camphor.

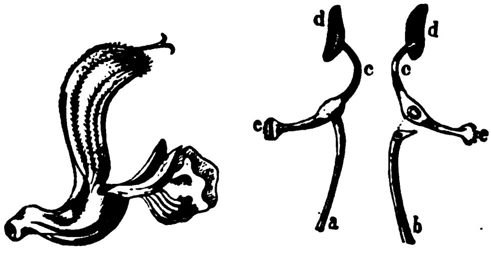
FIG. 312.



Salvia officinalis.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Water* (*Aqua Salviæ*), distil 1 part + water 10. *Gargle.*

FIG. 313.

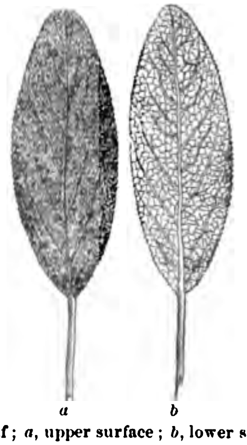


Salvia officinalis, flower; *a*, *b*, filaments; *c*, connective; *d*, fertile anthers; *e*, sterile anthers.

PROPERTIES.—Stimulant, tonic, astringent, vulnerary, condiment.

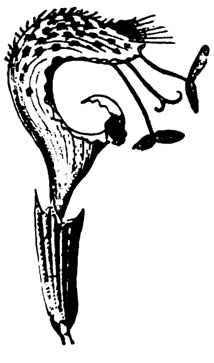
USES.—Ancients valued it highly for its named properties. At present mainly used as a condiment in seasoning fat fowl, pork, for dyspepsia, colliquative sweats. Externally, infusion in ulcers of mouth, throat; dries up milk, indurated sores, nasal catarrh. Gargle can be

FIG. 314.



Sage leaf; *a*, upper surface; *b*, lower surface.

FIG. 315.



Monarda punctata, flower magnified.

sweetened with sugar, honey, and have added to it vinegar, alum, borax, potassium chlorate, etc.

Allied Plants :

1. *S. prate'nsis.*—S. Europe. *S. lyra'ta.* N. America; slightly aromatic, and *S. polysta'chya, Chia-seed.* Mexico. All these are aromatic, bitter, and can be used like official. Infusions of all species, if taken hot produce and if cold check excessive sweating.

2. *Monar'da puncta'ta, Horse-mint.*—The leaves and tops official, 1820–1880. United States. Perennial, .6–1 M. (2–3°) high, stem branched, downy, leaves 5–7.5 Cm. (2–3') long, lanceolate, serrate, punctate, flowers yellow, spotted red with pinkish bracts, downy, calyx 5-toothed, aromatic, pungent, bitter, contains volatile oil. Used as carminative, stimulant, emmenagogue, nervine, diaphoretic, diuretic, for flatulent colic, sick stomach, rheumatism, neuralgia, diarrhœa; in infusion. Dose, gr. 15–60 (1–4 Gm.).

Oleum Monardæ (volatile oil) official, 1820–1880. It is yellow or red, sp. gr. 0.930, contains terpene, $C_{10}H_{16}$, 50 p. c., thymol (monardin), $C_{10}H_{14}O$, 25–61 p. c., also alcohol, $C_{10}H_{18}O$, and its acetic, butyric, and formic esters.

HEDEOMA. HEDEOMA (AMERICAN PENNYROYAL).

Hedeoma pulegioides, (*Linné*) *Persoon.* } The leaves and tops.

Habitat. N. America, New England, Dakota, southward to Georgia, etc.

Syn. Pennyroyal, Squaw Mint, Tick or Thick Weed, Stinking Balm. Fr. Herbe de Pouliot américain. Ger. Amerikanischer Polei.

He-de-o'ma. L. fr. Gr. *ἡδύς*, sweet, + *ὀσμή*, smell, referring to its smell, altered from *Hedyosmum*, Gr. *ἡδύοσμον*, named by Theophrastus.

Pu-leg-i-oi'des. L. fr. Gr. *ψύλλιον*, L. *pulegium*, fleabane, + *ο-ειδης*, L. *oides*, like or resembling, = *pulex*, pl. *pulices*, flea, fleas—pulegium-like Hedeoma; *i. e.*, has the appearance and odor similar to European pulegium.

Pen-ny-roy'al. Altered from *puliol-royal*, *penny* now used for obsolete *puliol*, *pulex*, a flea, + *regium*, royal; *i. e.*, royal against fleas, mosquitoes, etc.

PLANT.—An annual growing in barren, sandy fields, hills, open woods, dry places, scenting afar the surrounding air with its odor; stem 25–37.5 Cm. (10–15') high, quadrangular, pubescent, with many slender erect branches, root yellowish, fibrous. LEAVES, opposite, short-petioled, 12 Mm. (½') long, oblong, serrate, glandular beneath; branches roundish-quadrangular, hairy; flowers June–Aug., small axillary cymules, with tubular-ovoid, bilabiate, 5-toothed calyx and pale-blue, spotted, bilabiate corolla, containing 2 sterile and 2 fertile exserted stamens; odor strong, mint-like, taste warm, pungent. *Solvents:* alcohol; boiling water partially. Dose, gr. 15–60 (1–4 Gm.).

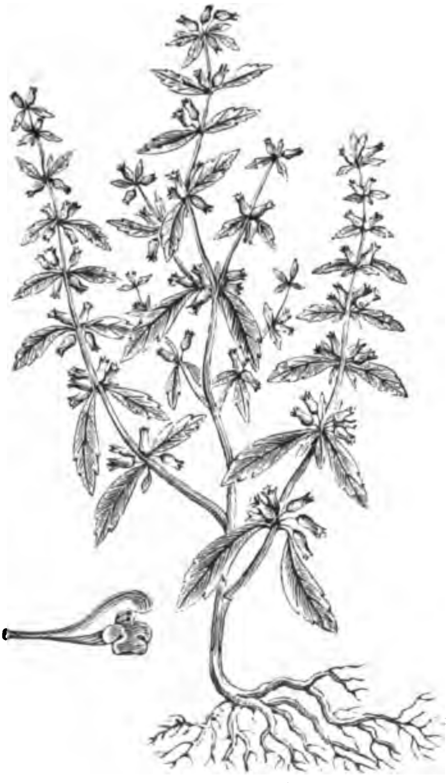
CONSTITUENTS.—Volatile oil 1 p. c., bitter principle, tannin.

Oleum Hedeomæ. Oil of Hedeoma (Oil of American Pennyroyal), *official.*—(Syn., Fr. Essence de Pouliot américain; Ger. Poleiöl.)

This volatile oil, distilled from Hedeoma with water or steam, is a yellowish, limpid liquid, characteristic, pungent, mint-like odor and taste, sp. gr. 0.935, soluble (clear) in twice volume alcohol 75 p. c., glacial acetic acid, carbon disulphide; contains hedeomol, $C_{10}H_{18}O$, 33 p. c. (this is a ketone, and its highest boiling portion is menthone), also pulegone, $C_{10}H_{16}O$, formic, acetic and isoheptoic acids. Dose, ♏ij–10 (.13–.6 Cc.).

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ʒss–2 (2–8 Cc.). *Infusion.* Dose, ℥ij (60 Cc.) every hour. *Spirit* (oil 1 + alcohol 9), used externally or in spray.

FIG. 316.

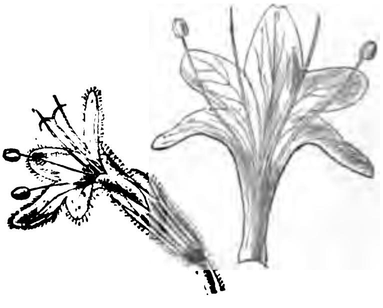


Hedeoma pulegioides.

PROPERTIES. — Stimulant, carminative, emmenagogue, aromatic.

USES.—Flatulent colic, sick stomach, painful digestion, to correct nauseating and griping purgatives. In hot infusion to dissipate diarrhœa, bronchial rheumatism, also taken with hot hip and foot baths in amenorrhœa. The odor is very repulsive to insects; fleas, mosquitoes, etc., hence the generic and specific names. The oil or spirit sprayed around or applied to cloths and laid about the room suffice in driving such pests away. In excessive doses for suppressed menses or abortion, death has occurred from narcosis. Oil often added to liniments as rubefacient.

FIG. 317.



Hedeoma pulegioides; flower and corolla, magnified.

Allied Plants:

1. *Me'ntha Pule'gium, European Pennyroyal.*—Resembles official; leaves oval, serrate, flowers in cymes, purplish, corolla 4-lobed.

2. *Hedeo'ma piperi'ta.*—Mexico. Used for peppermint, and *H. thymoi'des*, Texas. Odor more agreeable; used as aromatic, diaphoretic.

LABIATÆ.

MELISSA. MELISSA (BALM).

Melissa officinalis, *Linné.* } The leaves and tops.

Habitat. Asia Minor, S. Europe. Naturalized in United States, being found wild along road and lane fences; cultivated in gardens, etc.

Syn. Lemon-, Bee-, Blue-, or Sweet-balm, Citronelle, Cure-All, Dropsy Plant, Balm-mint, Herba Melissæ. Fr. Herbe au Citron, Céline. Ger. Folia (Herba) Melissæ, Melissenblätter, Citronenkraut.

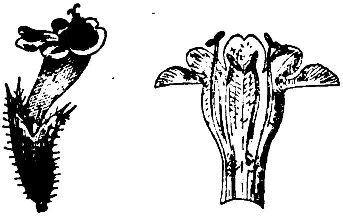
Me-lis′sa. L. fr. Gr. *μέλισσα*, a bee, *μέλι*, honey; *i. e.*, the bees collect much honey from the balm.

Of-fi-ci-na′lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

Balm. Contr. of *bal*(*sa*)*m*, fr. Heb. *balsam*, Gr. *βάλσαμον*, L. *balsamum*; *i. e.*, healing plant.

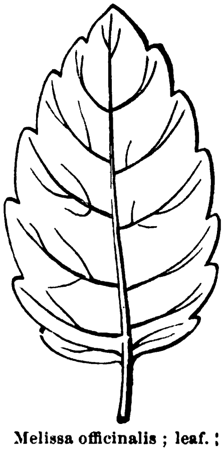
PLANT.—Perennial herb, growing in waste grounds, forests, fragrance of lemons; stems several, quadrangular, .3–1 M. (1–3°) high, branched at base, pubescent; flowers July–Aug., yellowish-white, purplish, 4-flowered cymules, calyx 5-toothed, tubular, bell-shaped; corolla bilabiate, 4 stamens. LEAVES, 5 Cm. (2′) long, petiolate, ovate, obtuse, rounded or subcordate at base, crenate, hairy, glandular, branches square; fragrant, aromatic, astringent, bitter. *Solvents:* diluted alcohol; boiling water. Dose, gr. 15–60 (1–4 Gm.).

FIG. 318.



Melissa officinalis; flower and corolla, magnified.

FIG. 319.



Melissa officinalis; leaf.;

ADULTERATIONS.—1. *Nepeta Cataria* var. *citrio′dora* has allied odor, but leaves cordate, gray-green, downy. 2. *Pogoste′mon Heynea′nus* (*Pat′chouli*). E. India. Leaves doubly crenate-serrate, very aromatic, seldom met with here; contain brownish-yellow volatile oil; used mostly in perfumery.

CONSTITUENTS.—Volatile oil ¼ p. c. (sp. gr. 0.890, soluble in alcohol), bitter principle, tannin, gum.

PREPARATIONS.—(Unoff.) *Water* (*Aqua Melissæ*, leaves 1 part, distil with water 10 parts). Dose, *ad libitum. Compound Spirit* (balm 14, lemon-peel 12, nutmeg 6, cinnamon 3, cloves 3, alcohol 150, water 250, distil 200 parts). *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). *Oil.* Dose, ♏j–2 (.06–.13 Cc.).

PROPERTIES.—Carminative, diaphoretic, stimulant, antispasmodic.

Uses.—Simply as a refreshing drink, when cold for febrile affections, when hot acts slightly on the skin.

Allied Plants:

1. *Hysso'pus officina'lis, Hyssop.*—S. Europe. Plant .3 M. (1°) high, stem square, leaves 2.5 Cm. (1′) long, punctate on both sides, flowers purplish-blue, stamens 4, exserted. Contains volatile oil ½ p. c., bitter principle, resin, fat. Used in Biblical times as a cathartic, now as a carminative, stimulant, sudorific for dyspepsia, amenorrhœa, rheumatism, bruises, bronchitis, sore throat, chronic catarrhs. Dose, gr. 15–60 (1–4 Gm.), in infusion, 5 p. c., or oil, ♏j–2 (.06–.13 Cc.).

2. *Ori'ganum vulga're, Wild Marjoram.*—The herb official, 1820–1860 and 1870–1890. Asia, Europe, N. Africa, naturalized in N. America. Perennial herb, .3–.5 M. (12–18′) high; stem square, purplish, downy; leaves 2.5 Cm. (1′) long, ovate, entire, pellucid-punctate, hairy beneath, flowers pale-purple, calyx 5-toothed, corolla 2-lipped, 4 exserted didynamous stamens, aromatic, pungent, bitter, contains volatile oil, 1 p. c., bitter principle, resin, tannin. *Oleum Origani*, official, 1820–1860 and 1870–1880. Consists mainly of terpene, $C_{10}H_{16}$. Used as carminative, stimulant, emmenagogue, diaphoretic, tonic, fomentation, for dyspepsia, indigestion, nausea, colic, rheumatism, neuralgia, in infusion. Dose, gr. 15–60 (1–4 Gm.). Oil used in liniments, carious teeth, flatulence. Dose, ♏v–10 (.3–.6 Cc.).

The closely allied *Origanum Majora'na, Sweet Marjoram,* is largely cultivated and used as a condiment in cooking.

THYMUS. THYME.

Oleum Thymi. **Oil of Thyme,** *official.*

Thymus vulgaris, *Linné.* } A volatile oil distilled from the leaves and flowering tops.

Habitat. S. Europe (Portugal to Greece). Cultivated in gardens, etc.

Syn. Common Garden Thyme, Mother of Thyme. Fr. Herbe Thym, Huile volatile (Essence) de Thym. Ger. Hebra Thymi, Thymian, Thymianöl.

Thy'mus. L. fr. Gr. θυμός, strength, its invigorating smell. Used in temples as incense for sacrifices.

Vul-ga'ris. L. ordinary, common, the kind growing wild and in common use.

Plant.—Small shrub, 25–30 Cm. (10–12′) high; stem and branches quadrangular; bark pale-brown, shoots purplish; leaves 6–12 Mm. (¼–½′) long, oval, blunt, entire, margin revolute, thick, smooth, dotted with many oil-glands, paler, pubescent beneath; flowers June–July, polygamous, cymes, forming capitate heads, pale-purple. Entire plant aromatic, peculiarly attractive to bees, flies, etc.

Constituents.—Volatile oil 2½ p. c. (thymol), tannin, gum.

Oleum Thymi. **Oil of Thyme.**—A yellowish liquid, strong thyme odor, aromatic, pungent, afterward cooling taste, darkens and thickens by age, sp. gr. 0.915, does not fulminate with iodine, soluble (clear) in half its volume of alcohol, also in all proportions of carbon disulphide, or glacial acetic acid. Contains thymol, $C_{10}H_{14}O$, most important constituent, also cymene, $C_{10}H_{14}$, and thymene, $C_{10}H_{16}$. The isomeric phenol, carvacrol, sometimes replaces a portion or all of the thymol; small quantities of linalool and bornyl acetate have also been found. *Tests:* 1. Oil + 1 drop ferric chloride T. S. gives greenish-brown color, changing to red. 2. Oil 1 Cc. + hot water 10 Cc., shake, cool, filter, + 1 drop ferric chloride T. S. to the filtrate, should not produce bluish or violet color (abs. carbolic acid). Oil should be kept cool, dark, in well-stoppered bottles. Dose, ♏j–5 (.06–.3 Cc.).

Thymol. Thymol.—(Syn., Acidum Thymicum, Thymic Acid, Methyl-propyl phenol; Fr. Acide Thymique; Ger. Thymolum, Thymiansäure.) This monatomic phenol occurs in the volatile oils of *T. vulgaris*, *Mona'rda puncta'ta*, and *Ptycho'tis Co'ptica* (Umbelliferæ), also probably in some other volatile oils of Labiatæ and Umbelliferæ families. It is obtained from any of these oils by distillation at 200° C. (392° F.); the more fluid distillate (hydrocarbons) is saved for various purposes, and the residue is subjected to freezing, whereby thymol crystallizes out; or may agitate this residue with soda solution, after a time add hot water to separate sodium-thymol solution from thymene and to allow the unattacked oil to float on top; to soda solution add hydrochloric acid, which sets thymol free; yield 20–61 p. c. Occurs in large, colorless, transparent, hexagonal crystals, thyme-odor, pungent, aromatic taste, slightly caustic to lips, sp. gr. 1.069, but when liquefied by heat is lighter than water, melts at 51° C. (123° F.); liquefies when triturated with equal quantity of camphor, menthol, or chloral hydrate, soluble in alcohol, ether, chloroform, carbon disulphide, glacial acetic acid, fixed and volatile oils, alkalies, slightly in water. *Tests:* 1. Thymol 1 Gm. + 5 Cc. of 10 p. c. soda solution, heated in a test-tube on water bath, should give clear, colorless, or slightly reddish solution, darkening on standing, but without separation of oily drops (abs. of thymene or levogyrate pinene), to this mixture add a few drops of chloroform, agitate, get violet color. 2. Heat thymol, and it should be completely volatile (abs. of paraffin, spermaceti, etc.). Thymol is isomeric with carvacrol and carvol, in oil of caraway, and should be kept in well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.).

PREPARATIONS.—(Unoff.) I. OIL: *Pills. Capsules.* II. THYMOL: *Solution*, for antiseptic spray (1 to 1,000). *Ointment*, 1–5 p. c. *Inhalation*, gr. 1 (.06 Gm.) to each. *Antiseptic Fluid*, 1 p. c. III. PLANT: *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.).

PROPERTIES.—I. OIL: Stimulant, tonic, emmenagogue, antispasmodic. If excessive doses given, have vomiting, depression, coldness, death by exhaustion, increased urine, which acquires green color and violet odor. II. THYMOL: Stimulant, antiseptic, deodorant, disinfectant, parasiticide, antipyretic, local anæsthetic. Its action stands between carbolic acid and oil of turpentine, being ten times less poisonous than the former, yet a far more powerful and permanent antiseptic; it is anæsthetic to the skin and mucous membranes, paralyzing the ends of sensory nerves; is eliminated by breath and urine.

Uses.—I. Oil : Chlorosis, rheumatism, neuralgia, bronchitis, diarrhœa, gleet, gonorrhœa, leucorrhœa, vesical catarrh ; externally in baths, lotions for scabies, muscular rheumatism, to correct fetor of secretions from sores, ulcers, gangrene. Applied to cotton for toothache, earache, for veterinary practice, scenting soap. II. Thymol : Precisely like the oil, not much internally, but externally as an antiseptic in surgery, fetor of sores, ulcers, gangrene, stomatitis, diphtheria, fetid bronchitis, coryza, rhinitis, ozæna, conjunctivitis, otorrhœa, gonorrhœa, uterine lochia, cancer, leucorrhœa, warts, skin diseases, psoriasis, eczema, diarrhœa, dysentery, typhoid fever, diabetes. A good dressing is thymol 1 Gm., alcohol 10 Cc., glycerin 30, water q. s. 1,000. Flies are fond of and are often attracted by it, which is its only objection.

Thymacetin, a derivative, is the same to thymol that phenacetin is to phenol, and is prepared similarly ; it is a white, crystalline powder, slightly soluble in water. Analgesic, hypnotic ; used in neuralgic headache like phenacetin. Dose, gr. 5–15 (.3–1 Gm.).

Thyme plant (fresh) is used as a condiment to aid digestion of fat pork, goose, duck, etc., and to flavor insipid dishes, as is sage, marjoram, parsley ; it is also used with other aromatic herbs in baths, cataplasms, fomentations, for rheumatism, gout, scabies, indolent ulcers.

MENTHA VIRIDIS. SPEARMINT.

Mentha spicata, *Linné.* } The leaves and tops.
(**Mentha viridis,** *Linné.*) }

Habitat. England, wild in Europe, N. America, cultivated in United States.

Syn. Mint, Mackerel, Lady's, Brown, Lamb or Common Garden Mint, Lammint, Sage of Bethlehem, Herba Menthæ Romanæ or Acutæ. Fr. Menthe (romaine) vert, Baume vert. Ger. Grüne Münze, Römische Minze.

Men'tha. L. fr. Gr. *μίνθη,* Minthe, a nymph, daughter of Cocytus, fabled to have been changed into a mint plant by Proserpine in a fit of jealousy (Theophrastus).

Spi-ca'ta. L. spiked ; *i. e.*, the flowers.

Vir'i-dis. L. green ; *i. e.*, the stem.

Spear'mint = spear + mint, from its spiry, spear-like inflorescence.

Plant.—Perennial herb ; rootstocks with elongated suckers, by which it multiplies extensively ; stems .6–1.3 M. (2–4°) high, acutely quadrangular, branches opposite, smooth, often tinged with purple ; flowers Aug.–Sept., calyx tubular, 5-toothed ; corolla 4-lobed, light-purple, stamens 4, rather long in terminal, interrupted, narrow, acute spikes. Leaves, 5–7.5 Cm. (2–3') long, sessile, serrate, glandular, nearly smooth, branches square, mostly light-green ; odor aromatic ; taste pungent. Should be collected for medicinal use in dry weather just as the flowers appear, if for oil collect just after flowers have expanded. This is weaker than peppermint, and probably is the cultivated form of *M. longifo'lia (sylve'stris), Horse Mint.* Loses on drying 75–85 p. c. *Solvents:* alcohol ; water partially. Dose, gr. 30–60 (2–4 Gm.).

Adulterations.—Leaves of peppermint and other *Mentha* species.

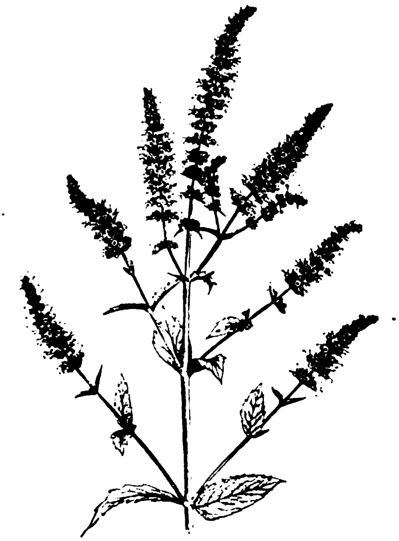
Constituents.—Volatile oil ½ p. c., resin, gum, tannin.

Oleum Menthæ Viridis. Oil of Spearmint, *official.*—(Syn., Fr. Essence de Menthe verte; Ger. Römisch Minzöl.)

This oil, distilled from fresh herb spearmint with water or steam, is a yellowish or greenish-yellow liquid, darker and thicker by age, with characteristic, strong odor of spearmint, taste hot, aromatic, sp. gr. 0.935, soluble (clear) in equal quantity of alcohol (turbid when diluted), glacial acetic acid and half quantity of carbon disulphide. Contains terpene, levogyrate limonene, $C_{10}H_{16}$, also levogyrate carvol, $C_{10}H_{14}O$, and possibly levogyrate pinene. It is preserved for a long time by adding 3–4 p. c. alcohol, and should be kept cool, dark, in well-stoppered bottles. Dose, ♏j–5 (.06–.3 Cc.).

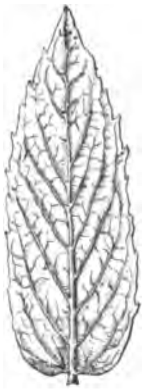
PREPARATIONS.—I. LEAVES AND TOPS: 1. *Spiritus Menthæ Viridis.* Spirit of Spearmint. (Syn., Tinctura Olei Menthæ Viridis, Essence of Spearmint; Ger. Grüne Minzessenz.)

FIG. 320.



Mentha spicata (viridis), flowering tops.

FIG. 321.



Mentha spicata (viridis), leaf natural size.

Manufacture: Macerate spearmint 1 Gm. + oil of spearmint 10 Cc. in alcohol q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

II. OIL: 1. *Aqua Menthæ Viridis.* Spearmint Water. (Syn., Fr. Eau de Menthe verte; Ger. Römisch Minzwasser.)

Manufacture: $\frac{1}{5}$ p. c. Triturate oil .2 Cc. with precipitated calcium phosphate .4 Gm., distilled water q. s. 100 Cc. Dose, ℥ss–1 (15–30 Cc.).

2. *Spiritus Menthæ Viridis.* Spirit of Spearmint, 10 p. c. Dose, ♏x–30 (.6–2 Cc.). See above.

Unoff. Preps.: I. LEAVES AND TOPS: *Infusion,* 5 p. c. Dose,

℥j–2 (30–60 Cc.). *Fluid Extract.* Dose, ʒj–2 (4–8 Cc.). II. LEAVES AND TOPS, OR OIL: *Syrup.* Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Carminative, stimulant, nervine; flavoring.

USES.—Same as peppermint, but as it is much milder it is to be preferred in infantile troubles, culinary purposes, confectionery, perfumery.

Allied Plants:

1. *M. cri'spa, Crisped-leaved, Cross* or *Curled Mint.*—This is the cultivated form of *M. spicata* (*viridis*), known also as *M. aqua'tica* var. *crispa.* Leaves pubescent, cordate pointed, crisped.

2. *M. sati'va, M. arve'nsis,* and *M. rotundifo'lia.*—All under cultivation, sometimes produce similar crisped leaves.

3. *Ly'copus virgin'icus, Bugle Weed.*—The herb official, 1830–1880, N. America. Plant has smooth, obtusely quadrangular stem, 15–60 Cm. (6–24′) high; leaves 5 Cm. (2′) long, elliptic, glandular; flowers purple, 4-lobed, stamens 2, mint-odor and taste bitter, root perennial, creeping, contains volatile oil, resin, bitter principle, tannin. Used as astringent, tonic, sedative, narcotic, for hemorrhage, diarrhœa, dysentery; in infusion, decoction. Dose, gr. 5–30 (.3–2 Gm.).

MENTHA PIPERITA. PEPPERMINT.

Mentha piperita, *Linné.* } The leaves and tops.

Habitat. Asia, Europe, N. America. Wild in low grounds, wet places. Cultivated in gardens, etc.

Syn. Brandy or Lamb Mint, Lammint. Folia (Herba) Menthæ Piperitæ. Fr. Menthe poivrée. Ger. Pfefferminz-blätter.

Pi-pe-ri'ta. L. *piper, pepper*—peppery-mint; *i. e.,* from its aromatic burning taste.

Pep'permint = pepper + mint; i. e., mint with pepper properties.

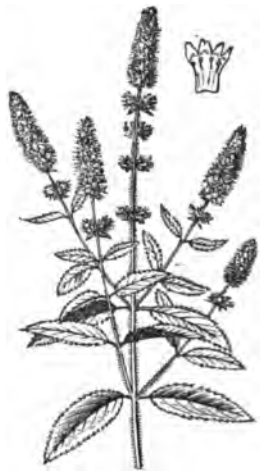
PLANT.—Perennial herb, possibly from *M. hirsu'ta, Water Mint,* by cultivation; rootstock creeping, producing long suckers by which it multiplies; stem square, purplish, .6–1.3 M. (2–4°) high; flowers Aug.–Sept.; calyx tubular, 5-toothed, often purplish; corolla purplish, 4-lobed; stamens 4, short, in terminal conical spikes. LEAVES, 5–7.5 Cm. (2–3′) long, petiolate, oval-lanceolate, acute, sharply serrate, glandular, nearly smooth, the few hairs containing menthol crystals in one or more thin cells, branches quadrangular, often purplish; odor aromatic; taste pungent, cooling. Should be collected for medicine in dry weather, Aug.–Sept., while blooming, and is the strongest and most pungent of all the mints. *Solvents:* alcohol; water partially. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—1. With leaves chiefly of varieties of this species: (*a*) var. *officinalis;* leaves narrower, spikes longer; (*b*) var. *vulgaris;* leaves broader, base more rounded, spikes more blunt and close. 2. With spearmint leaves; these can be readily distinguished, as peppermint has leaves with petioles, inflorescence thicker, more crowded, flowers larger with shorter calyx teeth, and its own distinctive odor and taste.

CONSTITUENTS.—Volatile oil 1 p. c. (menthol), resin, tannin, gum.

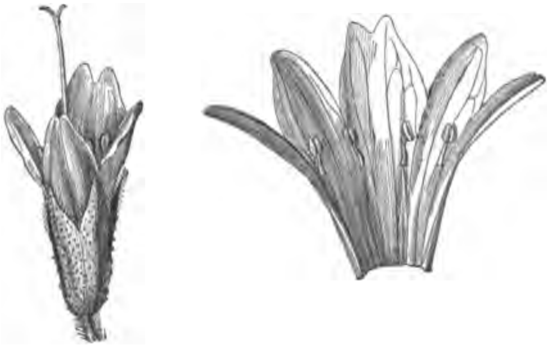
Oleum Menthæ Piperitæ. Oil of Peppermint, *official.*—(Syn., Fr. Essence de Menthe poivrée; Ger. Pfefferminzöl.) This volatile oil, obtained from fresh peppermint by distillation with water or steam, is a greenish-yellow liquid, darkens and thickens with age, characteristic, aromatic, pungent odor and taste, followed by sense of coolness; sp. gr. 0.910; does not fulminate with iodine; soluble (clear) in equal volume alcohol, in all proportions glacial acetic acid, and carbon disulphide. Contains fifteen constituents, but chiefly menthol (mint camphor or stearopten) 50 p. c., Japanese oil 30 p. c.; distilled with P_2O_5, yields menthene, $C_{10}H_{18}$, a colorless liquid of pleasant odor. The hydrocarbons holding menthol dissolved are mainly several terpenes with carvene-odor, the higher boiling ones, $C_{15}H_{24}$, having less pleasant odor. The oil is preserved a long time by adding 3–4 p. c. alcohol. *Tests:* 1. Oil 1 drop + nitric acid 5 Cc., gently agitated and let stand three hours, should be yellowish but not bright-red (abs. oils of camphor and sassafras). 2. Oil in a test-tube immersed into salt and ice should within fifteen minutes become cloudy and thick, and with a menthol crystal added should form crystalline mass (distinction from dementholized oil). 3. Should not dissolve tannin and upon being distilled the distillate should not resemble alcohol. Dose, ♏j–5 (.06–.3 Cc.).

FIG. 322.



Mentha piperita; flowering tops.

FIG. 323.



Mentha piperita; flower and corolla cut open; magnified 8 diam.

ADULTERATIONS.—With oil of erigeron, castor oil, oil of turpentine, oil of copaiba, oil of camphor, oil of sassafras, alcohol; the first, second and third prevent its solubility in equal volume alcohol (80 p. c.); the fourth gives buttery mass with sulphuric acid; oils of turpentine, camphor and sassafras each renders its action with iodine more violent, the two latter being red with nitric acid.

Menthol. **Menthol**, $C_{10}H_{19}OH$, *official.*—This is a stearopten (having the character of a secondary alcohol) obtained from official oil of peppermint (*M. piperita*), or from Japanese or Chinese oil of peppermint (*M. arve'nsis* var. *pipera'scens* and *M. canade'nsis* var. *glabra'ta*). To obtain this the volatile oil is simply subjected to refrigeration at —22.2° C. (—8° F.) by means of ice and salt; when solidified the temperature is allowed to rise gradually, the resulting liquid occasionally poured off, and crystals deprived of oil by expression; may be purified by recrystallization. It is in colorless, acicular or prismatic crystals, with strong odor of pure peppermint, warm, aromatic, finally cooling taste, soluble in alcohol, ether, chloroform, glacial acetic acid. Melts at 43° C. (109.4° F.) to a colorless liquid, which boils at 212° C. (414° F.) is slightly volatile at ordinary temperature. When triturated with equal weight of camphor, thymol, or chloral hydrate, the mixture becomes liquid. It is a secondary alcohol, oxidizing with chromic acid into ketone, menthone, $C_{10}H_{18}O$. Combines with organic acids to form esters—menthyl formate, valerianate; with dehydrating agents converted into hydrocarbons menthene, and dimenthene. *Tests:* 1. When heated on water bath should be completely volatile (abs. wax, paraffin, or inorganic substances). 2. A few crystals dissolved in 1 Cc. glacial acetic acid + 3 drops sulphuric acid + 1 drop nitric acid should not give green color (abs. of thymol).

ADULTERATIONS.—Mostly with wax, paraffin, magnesium sulphate, thymol.

PREPARATIONS.—I. LEAVES AND TOPS: 1. *Spiritus Menthæ Piperitæ.* Spirit of Peppermint. (Syn., Essence of Peppermint; Fr. Alcoolat (Essence) de Menthe poivrée; Ger. (Englische) Pfefferminz (-essenz)-spiritus.)

Manufacture: Macerate peppermint 1 Gm. + oil of peppermint 10 Cc. in alcohol q. s. 100 Cc. Dose, ♏x–30 (.6–2 Cc.).

Prep.: 1. *Mistura Rhei et Sodæ,* 3.5 p. c. Dose, ʒij–16 (8–60 Cc.).

II. OIL: 1. *Aqua Menthæ Piperitæ.* Peppermint Water. (Syn., Fr. Eau de Menthe poivrée; Ger. Pfefferminzwasser.)

Manufacture: $\frac{1}{5}$ p. c. Triturate oil .2 Cc. with precipitated calcium phosphate .4 Gm., distilled water q. s. 100 Cc. Dose, ℥ss–1 (15–30 Cc.).

2. *Spiritus Menthæ Piperitæ.* Spirit of Peppermint, 10 p. c. Dose, ♏x–30 (.6–2 Cc.). See above.

3. *Trochisci Menthæ Piperitæ.* Troches of Peppermint. (Syn., Fr. Pastilles (Tablettes) de Menthe anglaises; Ger. Pfefferminzpastillen.)

Manufacture: Oil 1 Cc. + sugar 80 Gm., mucilage of tragacanth q. s. for 100 troches. Dose, 1–2 troches occasionally.

4. *Pilulæ Rhei Compositæ,* ♏ $\frac{1}{13}$ (.005 Cc.) in each pill. Dose, 1–5 pills.

Unoff. Preps.: Infusion, 5 p. c. ℥j–2 (30–60 Cc.). *Fluid Extract.* Dose, ʒj–2 (4–8 Cc.). *Syrup.* Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Carminative, stimulant, nervine, antispasmodic.

USES.—Spasmodic stomach and bowel pains, flatulency, nausea, cholera morbus, diarrhœa, dysentery, colic, dysmenorrhœa, nervous headache, hiccough, heart palpitation, vomiting, as a flavoring agent; externally the oil and menthol for rheumatism, neuralgia, toothache, antibacterial.

LAVANDULA. LAVENDER.

Oleum Lavandulæ Florum. Oil of Lavender Flowers, *official*.

Lavandula angustifolia, (*Linné*) *Miller*. } A volatile oil, distilled from
(**Lavandula officinalis,** *Choisy*.) } the fresh flowers.

Habitat. S. Europe (France, Italy, Spain), N. W. Africa, sunny hillsides and mountains; cultivated.

Syn. Garden, Common or Spike Lavender, Flores Lavandulæ. Fr. Lavande officinale, Essence de Lavande. Ger. Lavendelblüthen, Lavendelöl.

La-van′du-la. L. fr. *lavo, lavare*, to wash; *i. e.*, medieval name, in allusion to the use made of its distilled water for bathing.

An-gus-ti-fo′li-a. L. *angustus*, narrow, +*folium*, a leaf; *i. e.*, has narrow leaves.

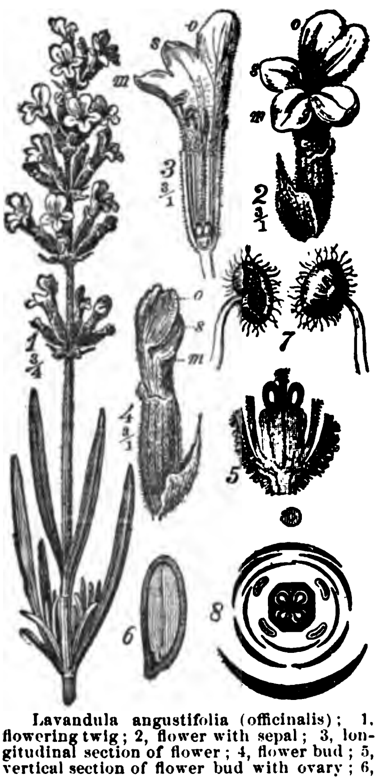
Of-fi-ci-na′lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

PLANT.—Shrub .3–1 M. (1–3°) high; stem crooked, branched, bark brownish-gray, much cleft when old; leaves linear, sessile, entire, revolute margins, with whitish down, crowded at bases of the quadrangular branches; flowers June–July, lilac-colored, terminal spikes, two-lipped, hairy, glandular. Whole plant delightfully fragrant.

CONSTITUENTS.—Volatile oil 1–3 p. c., resin, tannin.

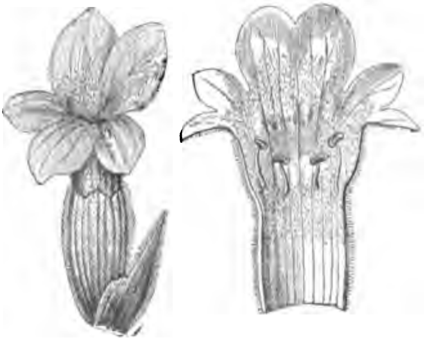
Oleum Lavandulæ Florum. Oil of Lavender Flowers.—A yellowish liquid, fragrant odor, pungent, bitter taste, sp. gr. 0.890, contains a terpene, $C_{10}H_{16}$, two alcohols

FIG. 324.



Lavandula angustifolia (officinalis); 1, flowering twig; 2, flower with sepal; 3, longitudinal section of flower; 4, flower bud; 5, vertical section of flower bud with ovary; 6, vertical section of little nut; 7, stamens; 8, diagram of flower.

FIG. 325.



Lavender flower and corolla, magnified 4 diam.

—geraniol, $C_{10}H_{18}O$, and (chiefly) linalool, $C_{10}H_{18}O$, also its compound ether—linaloyl acetate, $C_{10}H_{17}C_2H_3O_2$, 30–36 p. c. upon which the value depends, and a little cineol. If much of this latter it proves the adulteration with oil of spike lavender; when cold deposits stearopten. If distilled from leaves and stalks, odor more rank; the best is often called oil of garden lavender, and should be kept cool, dark, in well-stoppered bottles. *Tests:* 1. Soluble in all proportions of alcohol (dif. from oil of turpentine), also in 3 volumes alcohol 75 p. c. (dif. from and abs. of oil of turpentine), also in glacial acetic acid. 2. Should not yield a distillate resembling alcohol. Dose, ♏j–5 (.06–.3 Cc.).

ADULTERATIONS.—With oil of turpentine (less soluble in alcohol), oil of spike lavender (greener, more terebinthinate, camphoraceous odor, with more terpene and cineol, oil of sweet basil (*O'cimum Basi'licum*). Asia, Africa. This plant is cultivated in gardens for seasoning food and its white or reddish flowers; oil is balsamic, aromatic, possessing a cooling taste.

PREPARATIONS.—1. *Spiritus Lavandulæ.* Spirit of Lavender. (Syn., Fr. Alcoolat (Esprit, Eau) de Lavande; Ger. Lavendelspiritus.)

Manufacture: 5 p. c. Dissolve oil 5 Cc. in deodorized alcohol 95 Cc. Dose, ʒss–1 (2–4 Cc.).

2. *Tinctura Lavandulæ Composita.* Compound Tincture of Lavender. (Syn., Spiritus Lavandulæ Compositus, Lavender Drops; Fr. Teinture de Lavande composée; Ger. Zusammengesetzte Lavendel-tinktur.)

Manufacture: ⅘ p. c. Dissolve oil .8 Cc. + oil of rosemary .2, in alcohol 70, add water 25; with this percolate cassia cinnamon 2 Gm., cloves .5, nutmeg 1, red saunders 1, finishing with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Prep.: 1. *Liquor Potassii Arsenitis*, 3 p. c. (arsenous acid 1 p. c., potassium bicarbonate 2 p. c.). Dose, ♏iij–5 (.2–.3 Cc.).

Unoff. Preps.: *Water* (*Aqua*). Of flowers can have *Infusion* and *Fomentation.*

PROPERTIES.—Stimulant, carminative, nervine, errhine.

USES.—Gastralgia, nausea, flatulence, to correct nauseating medicines, nervous headache; mostly in perfumery.

Flowers, official, 1840–1890. *Oleum Lavandulæ*, official, 1880–1890; distilled from the entire fresh flowering plant.

Allied Plants:

1. *L. spica, Spike Lavender, Male Lavender.*—The flowers official, 1820–1840. S. France, cultivated. Plant .3–.5 M. (12–18′) high, branching from base; leaves broad, oblanceolàte, sessile, revolute at the edge, with whitish down; flowers July, villous, lilac-colored. *L. stœ'chas, Arabian* or *French Lavender.* Flowers dark-purple; odor aromatic, camphoraceous. These with other varieties used for obtaining the oil.

2. *Collinso'nia canade'nsis, Stone-root, Horse-balm.*—N. America. Rhizome 10 Cm. (4′) long, branches short, knotty, white inside, inodorous, taste bitter, nauseous. Contains volatile oil, resin; diaphoretic, diuretic, irritant.

LABIATÆ.

ROSMARINUS. ROSEMARY.

Oleum Rosmarini. Oil of Rosemary, *official.*

Rosmarinus officinalis, *Linné.* } A volatile oil distilled from the leaves.

Habitat. Mediterranean Basin (Spain to Asia Minor, N. Africa, reaching to Madeira and the Canary Islands). Cultivated in gardens.

Syn. Garden Rosemary, Folia Rosmarini—Roris Marini—Anthos, Oleum Anthos. Fr. Romarin, Huile volatile (Essence) de Romarin. Ger. Rosmarin, Rosmarinöl.

Ros-ma-ri′nus. L. *ros*, dew, mist, + *marinus*, *maris*, of the sea—sea foam; *i. e.*, from its maritime habitat and glaucous appearance. *Rosemary*—not Mary's rose.

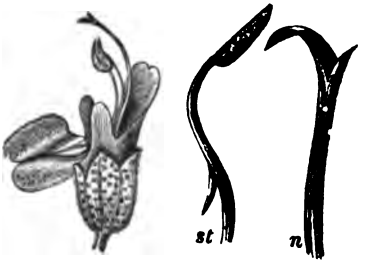
Of-fi-ci-na′lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

PLANT.—Small perennial shrub 1–1.3 M. (3–4°) high, bushy, much branched; bark pale-brown, twigs tomentose; flowers April–May, bilabiate, upper lip 2-parted, lower 3-divided, middle one being the largest, pale-blue; fruit achenes, subglobose, smooth; leaves evergreen, many, sessile, 2.5 Cm. (1′) long, linear, both ends blunt, entire, margins revolute, dark-green, shining above, woolly with white, stellate hairs beneath, like the flowers, with aromatic fragrance, camphor-like; taste bitter.

CONSTITUENTS. — Volatile oil 1 p. c., resin, tannin, bitter principle.

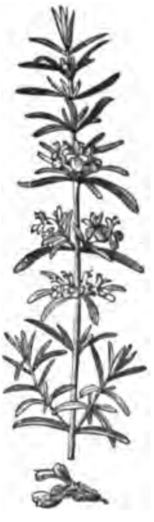
Oleum Rosmarini. Oil of Rosemary.—A pale-yellow, limpid liquid, characteristic pungent odor of rosemary, warm camphoraceous taste, sp. gr. 0.900, soluble in equal volume alcohol, 80 p. c., glacial acetic acid; contains pinene, $C_{10}H_{16}$, 80 p. c., borneol, $C_{10}H_{17}OH$, cineol, $C_{10}H_{18}O$, camphor, $C_{10}H_{16}O$. Dose, ♏j–5 (.06–.3 Cc.).

FIG. 326.



Rosmarinus officinalis; *st*, stamen with anther; *n*, style with stigma.

FIG. 327.



Rosmarinus officinalis; branch and flowers.

ADULTERATIONS.—The oil is found mixed with oil of turpentine. *Test:* An equal volume of alcohol added dissolves out rosemary oil, leaving behind oil of turpentine.

PREPARATIONS.—1. *Linimentum Saponis*, 1 p. c. Use externally.

2. *Tinctura Lavandulæ Composita*, $\frac{1}{5}$ p. c. Dose, ʒss–1 (2–4 Cc.).

PROPERTIES.—Carminative, stimulant, diuretic, diaphoretic, emmenagogue. Excessive doses cause death.

USES.—Colic, nervous disorders, menstrual trouble. Externally in rheumatism, sprains, bruises. Stimulates the hair in alopecia, reduces temperature, and imparts violet odor to urine. Mainly used in liniments, lotions, ointments, perfumery.

Tops or *Leaves*, official, 1820–1890.

76. SOLANACEÆ. Nightshade (Potato) Family.

Sol-a-na′se-e. L. *Solan-um* + aceæ, fr. *sol*, the sun, *i. e.*, its plants dislike it, grow best in the shade, hence nightshade; or *solor* to comfort, *i. e.*, its soothing, narcotic effect; or *sulanum*, *sus*, hog, *i. e.*, cure for swine diseases. Herbs, rarely shrubs, trees. Distinguished by having colorless juice, mydriatic alkaloids, alternate leaves; flowers regular, 5's, isomerous, plicate border; ovary superior, 2-celled, ovules many, embryo straight or coiled in fleshy albumin; fruit, capsule or berry, some edible. Differs from Convolvulaceæ by not twining and having many seeds; universal, tropics; narcotic, stimulant, bitter, tonic, poisonous.

Genera: 1. **Solanum.** 2. **Capsicum.** 3. **Atropa.** 4. **Hyoscyamus.** 5. **Datura.** 6. **Nicotiana.**

DULCAMARA. DULCAMARA (BITTERSWEET).

Solanum Dulcamara, *Linné.* } The young branches.

Habitat. Europe, Asia Minor, China, India, N. Africa, naturalized in N. America.

Syn. Woody-, Garden- or Bittersweet Nightshade, Violet Bloom, Scarlet Berry, Nightshade Vine, Fever Twig, Felon Wort, Staff Vine. Fr. Tiges de Douce-amère (de morelle Grim-pante). Ger. Bittersüss-Stengel, Stipites Dulcamaræ, Alpranken.

So-la′num. L. see etymology, above, of Solanaceæ.

Dul-ca-ma′ra. L. *dulcis*, sweet, + *amarus*, bitter; *i. e.*, its taste first bitter, then sweet.

PLANT.—Climbing shrub, pubescent; stem woody at base, branching, 3–4.5 M. (10–15°) high, around dwellings, hedges, thickets, moist banks; leaves cordate, halberd-shaped, pubescent beneath; flowers June–Sept., purple, whitish, small, cymes; fruit oval red berry, many-seeded. BRANCHES, one to two years old are collected (in autumn or early spring), size of a goose quill, 6 Mm. (¼′) thick, cylindrical, somewhat angular, striate, warty, hollow, in short sections, bark thin, pale-greenish-brown, marked with alternate leaf-scars, inside green; the greenish-yellow wood forms one or two concentric rings; odor slight; taste bitter, then sweet, when fresh odor unpleasant. *Solvents:* alcohol; diluted alcohol; water. Dose, ʒss–1 (2–4 Gm.).

ADULTERATIONS.—The cut stems of *Hu′mulus Lu′pulus*, and *Loni′cera Pericly′menum;* neither resemble Dulcamara very closely.

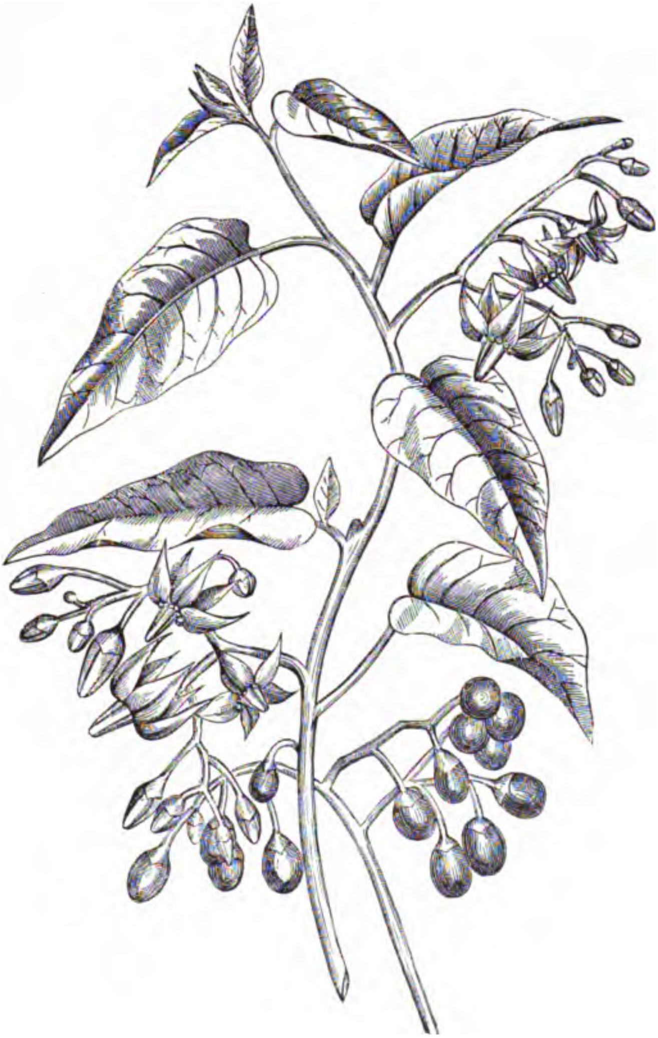
CONSTITUENTS.—Dulcamarin (glucoside), $C_{22}H_{34}O_{10}$, 0.4 p. c., Solanine, $C_{42}H_{87}NO_{15}$, resin, gum, wax, starch, calcium lactate.

Dulcamarin.—Obtained by digesting aqueous infusion with animal charcoal, washing this and exhausting it with boiling alcohol, evaporating, dissolving in water, precipitating with ammonia, and the filtrate with lead subacetate; digesting washed precipitate with alcohol, decomposing it with hydrogen sulphide. It is a yellowish powder, bitter, then sweet, soluble in alcohol or water; yields frothing solutions, by acids splits into sugar and dulcamaretin, $C_{16}H_{26}O_6$.

Solanine.—In white crystals or powder, resembling quinine, bitter, inodorous, by heat forming solanidine, soluble in alcohol. Dose, gr. ¼–2 (.016–.13 Gm.).

PREPARATIONS.—1. *Extractum Dulcamaræ Fluidum.* Fluid Extract of Dulcamara. (Syn., Fluid Extract of Bittersweet; Fr. Extrait liquide de Douce-Amère; Ger. Flüssiges Bittersüss-Extrakt.)

FIG. 328.



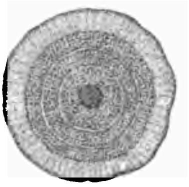
Solanum Dulcamara

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 5–15 (.3–1 Gm.). *Decoction,* 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Narcotic, diuretic, diaphoretic, alterative, deobstruent. Large doses produce nausea, vomiting, faintness, vertigo, convulsive muscular movements, stinging in the throat, thirst, diarrhœa, paralysis of central nervous system, heart action and respiration are weakened.

FIG. 329.



Dulcamara; transverse section of a branch, magnified 3 diam.

USES.—Cutaneous eruptions, psoriasis, acne, eczema, rheumatism, gout, bronchitis, whooping-cough, nasal, vesical and pulmonary catarrhs, diarrhœa in children caused by cold or dampness, mania with strong venereal desire, neuralgia.

Allied Plants:

1. *S. panicula'tum.*—S. America; tonic, diuretic, antiperiodic, vesical catarrh. *S. caroline'nse, Horse-Nettle.* United States; aphrodisiac, tincture for epilepsy. Dose, ʒss–1 (2–4 Cc.).

2. *Ly'cium vulga're.*—United States, Europe. *L. a'frum.* N. Africa, and *L. umbro'sum.* S. America. The leaves of these in infusion good for erysipelas and skin diseases.

CAPSICUM. CAPSICUM (CAYENNE OR AFRICAN PEPPER).

Capsicum fastigiatum, *Blume.* } The fruit.

Habitat. S. and C. America (Cayenne in Guiana), introduced into E. Indies, Java (by Portuguese), also into Africa, cultivated in United States, also in tropics.

Syn. Spanish, Red, Bird, Garden, Cockspur, Pod, Chilly, Zanzibar, Goats, Guinea, American Cayenne or African Cayenne Pepper, Chillies. Piper Hispanicum. Fr. Capsique, Piment (rouge) des jardins, Poivre de Cayenne-, Guinée or d'Inde. Ger. Fructus Capsici, Spanischer Pfeffer, Schlotenpfeffer.

Cap'si-cum. L. *capsa,* a box; *i. e.,* shape of the fruit; or from κάπτω, to bite; *i. e.,* from its hot, pungent properties.

Fas-tig-i-a'tum. L. *fastigiatus,* pointed, tapering; *i. e.,* shape of the fruit.

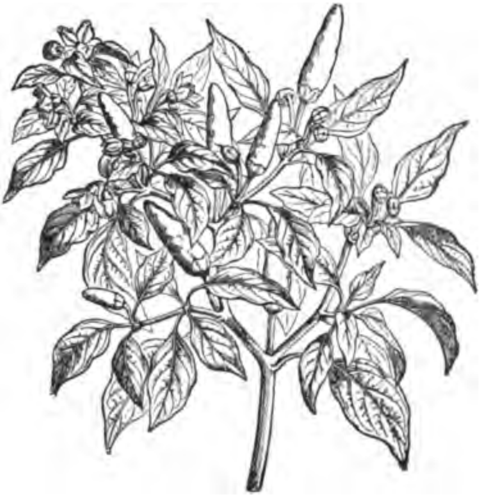
PLANT.—Herb .6–1 M. (2–3°) high; stems spreading; leaves 5–7.5 Cm. (2–3′) long, flowers July–Aug., 2–3 together in the bifurcations, yellow. FRUIT, oblong-conical, 12–18 Mm. (½–¾′) long, 5 Mm. (⅕′) thick, scarlet, supported by 5-toothed calyx, shrivelled on drying, 2-celled, seeds yellowish, reniform, central placenta; odor peculiar; taste intensely hot; powder dark-orange-red, fading upon age. Mostly imported from Liberia, Zanzibar, Natal, Bombay, Penang, Pegu, Cayenne, although we grow nearly our entire supply. The fruit is plucked, exposed to sun until dried and then packed in suitable shape for market. *Solvents:* alcohol; ether; hot water partially. Dose, gr. 1–8 (.06–.5 Gm.).

ADULTERATIONS.—With fruits of allied species. The powder with red lead oxide, colored sawdust, bran, etc., the former recognized by adding diluted nitric acid to dissolve lead and precipitating same with sodium sulphate; the latter two detected by the microscope.

CONSTITUENTS.—Capsaicin (capsacutin, capsicin) 0.02 p. c., Capsicine, Volatile oil, fixed oil, fat acids (oleic, stearic, palmitic), resin, red coloring matter (chlosterin ester of the fatty acids), ash 4–5 p. c.

Capsaicin, $C_{18}H_{28}NO_3$.—Thought to be identical with capsacutin, resides mostly in the pericarp and placenta; it is the chief, active constituent, and is obtained by adding dilute caustic alkali to the petroleum extract, passing CO_2 through this alkaline solution, when it crystallizes out in colorless form. It is soluble in alcohol, ether, benzene, fixed oils and its vapors are severely acrid and irritating. It has also been obtained as an oleo-resin (capsicin), amorphous resin-like acid, to which the red coloring matter persistently adheres. Dose, gr. $\frac{1}{10}$–$\frac{1}{4}$ (.006–.016 Gm.).

FIG. 330.



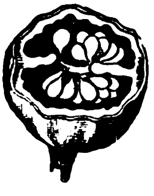
Capsicum fastigiatum.

Capsicine.—This occurs in small quantity; it is a volatile alkaloid, having odor of conine—devoid of pungency—and is an oily liquid, not existing in the unripe fruit, but results from decomposition processes in ripening.

FIG. 331.

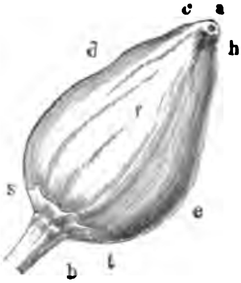
Capsicum fruit, magnified.

FIG. 332.



Capsicum fruit; cross-section, magnified.

FIG. 333.



Capsicum annuum; fresh fruit, one-half natural size.

Volatile Oil.—Obtained by distillation and gives to the fruit its odor.

PREPARATIONS.—1. *Extractum Capsici Fluidum.* Fluid Extract of Capsicum. (Syn., Fr. Extrait liquide (de Capsique) de Piment des jardins; Ger. Flüssiges Spanischer Pfeffer-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏j–8 (.06–.5 Cc.).

2. *Oleoresina Capsici.* Oleoresin of Capsicum. (Syn., Fr. Oléorésine (Extrait Éthéré) de Capsique; Ger. Spanischpfeffer-Oelharz.)

Manufacture: Percolate 100 Gm. with ether until exhausted, recover ether, strain out and reject fatty matter; yield 6–15 p. c. Dose, ♏¼–1 (.016–.06 Cc.).

Prep.: *Emplastrum Capsici.* Capsicum Plaster. (Syn., Fr. Sparadra(pum) Capsici (de Capsique); Ger. Capsicumpflaster.)

Manufacture: Cover muslin with melted resin plaster; when cool coat this over with capsicum oleoresin by means of a brush—a piece 10 Cm. (4′) square requiring about 4 minims (.26 Cc.).

3. *Tinctura Capsici.* Tincture of Capsicum. (Syn., Fr. Teinture de Piment des jardins; Ger. Spanischpfeffertinktur.)

Manufacture: 5 p. c. Percolate 5 Gm. with alcohol 95 p. c., q. s. 100 Cc. Dose, ♏x–60 (.6–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. ½–2 (.03–.13 Gm.). *Infusion,* 5 p. c. Dose, ʒij–4 (8–15 Cc.).

PROPERTIES.—Stimulant, stomachic, rubefacient, condiment, diaphoretic; stimulates flow from salivary, gastric and intestinal glands, also the stomach walls and heart.

USES.—Indigestion, dyspepsia, atonic gout, alcoholism, delirium tremens, intermittents; flatulent colic, low fevers, cholera, menorrhagia, seasickness, tonsillitis, scarlet fever, diphtheria, hemorrhoids; externally—lumbago, rheumatism, neuralgia, chilblains, relaxed uvula. Was known to the Romans, and used from time immemorial in E. Indies.

Allied Plants:

1. *C. a′nnuum (lon′gum).*—Fruit official, 1820–1880. Fruit 5–10 Cm. (2–4′) long, 2.5–4 Cm. (1–1½′) thick, oblong, conical, sometimes curved, or subglobular, yellow or red, brown when dry. Known in England as pod pepper, but often sold as *chillies* or *capsicums,* and is the kind recognized by the Ger. Phar.

2. *C. frute′scens.*—Like official, 8–12 Mm. (⅓–½′) long, 3–4 Mm. (⅛–⅙′) thick; *C. cerasifo′rme* resembles a cherry. All three sometimes used for purposes similar to official.

BELLADONNA. BELLADONNA.

1. BELLADONNÆ FOLIA. Belladonna Leaves.
2. BELLADONNÆ RADIX. Belladonna Root.

Atropa Belladonna, *Linné.* } The leaves and root.

Habitat. C. and S. Europe, Asia Minor, Algeria, in waste ground, mountainous woods. Cultivated in Germany, France, England, N. America.

Syn. Deadly or Sleeping Nightshade, Death's Herb, Banewort, Mekilwort, Black or Poison Black Cherry, Dwale. Fr. Belladone, Morelle furieuse, Feuilles de Belladone, Racine de Belladone. Ger. Toll (Wolf's) Kirsche, Tollkraut, Belladonna, Belladonna Blätter, Belladonnawurzel.

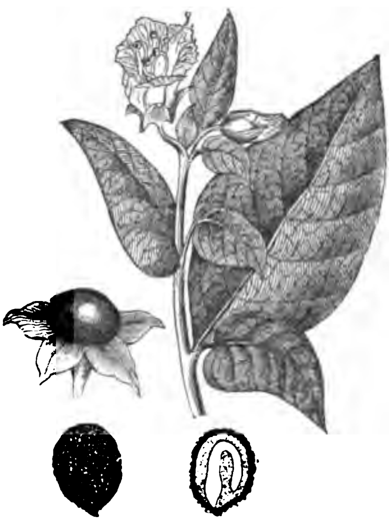
SOLANACEÆ.

At′ro-pa. L. fr. Gr. Ἄτροπος = ἀ, priv. + τρέπειν, to turn—not to turn, to be inflexible. One of the mythological fates, whose office it was to cut the thread of life. With this poisonous fruit or plant the functions of office could easily be performed.

Bel-la-don′na. L. *bella*, beautiful, + *donna*, a lady; *i. e.*, the berries were used by the Italian ladies as a cosmetic, and to dilate their eye pupils, thus giving them a strikingly handsome appearance.

PLANT.—Bushy perennial, 1–1.5 M. (3–5°) high; stems thick, smooth, purplish; flowers June–July, 2.5 Cm. (1′) long, dark-purple, bell-shaped, in 5's; fruit Sept., purplish-black, berries size of a cherry. Grows in stony, shady, bushy places, along walls, amidst rubbish, preferring chalk and limestone soil. All parts are active, and this applies equally to the cultivated and wild-grown plants. LEAVES, 10–15 Cm. (4–6′) long, 5–10 Cm. (2–4′) broad, ovate-oblong, equilaterally narrowed into a petiole, tapering at apex, entire, smooth, thin, upper surface brownish-green, lower grayish-green, both, however, whitish punctate from cells containing crystalline powder (calcium oxalate); odor slight; taste bitter, disagreeable. These should be collected June–July while in flower, from plants between two and four years old. Dose, gr. ½–3 (.03–.2 Gm.). ROOT, occurs in cylindrical, somewhat tapering pieces, 20–30 Cm. (8–12′) long, 12–25 Mm. (½–1′) thick, longitudinally wrinkled; externally brownish-gray, internally whitish; fracture nearly smooth and mealy; bark thick, free from bast-fibres, wood in broad wedges, and equally wide medullary rays, nearly inodorous; taste sweetish, then bitter acrid; roots, which are tough, woody, breaking with splintery fracture, and the hollow stem-bases should be rejected. The roots should always be collected in autumn or early spring, and the English is more reliable than the German. *Solvents:* diluted alcohol or alcohol (65 p. c.); hot water partially. Dose, gr. ½–2 (.03–.13 Gm.).

FIG. 334.



Belladonna branch; fruit, seed, and section of seed, the last two magnified.

ADULTERATIONS.—*Leaves:* Sometimes with those of digitalis, hyoscyamus, stramonium, verbascum, all of which are hairy, more or less lobed, differently colored and veined; also *Sola′num ni′grum*, black nightshade, leaves smaller, dentate, and *Scopo′l(i)a carnio′lica*, leaves oblong-ovate, contain scopaline which is a mydriatic equal to atropine, but without any irritating properties. *Root:* Occasionally with roots of allied species, also of *Medica′go sati′va*, which has solid crown-branches and thinner bark. The roots of inula, spikenard, and parsley have similar appearance.

CONSTITUENTS.—Atropine, 0.2–0.6 p. c., Belladonine, Hyoscyamine, atropamine, atrosin, malic acid, starch; Leaves have, in addition, choline (bilineurine), albumin, mucilage, wax, asparagin, chrysatropic acid (scopoletin), succinic acid, nitrates, ash, 14 p. c. (= Ca, Mg, K, carbonates).

Atropina, Atropine, $C_{17}H_{23}NO_3$, *official.*—(Syn., Atropia; Fr. Atropine; Ger. Atropinum, Atropin.) This alkaloid, in commerce always contains a little hyoscyamine, which is separated with difficulty, as they are both extracted together by agitating an alcoholic tincture of the root with slaked lime, to decompose the natural salt and liberate the alkaloid, which remains in solution, acidify filtrate with diluted sulphuric acid, concentrate to remove alcohol, fat, resin, and to the filtrate add potassium carbonate in excess; purify by dissolving this washed precipitate (atropine) in alcohol, and adding water until slightly turbid, then allow to crystallize. Occurs in white crystals, or powder, odorless, bitter, acrid, yellowish on exposure, soluble in 3 parts alcohol, 4 chloroform, no residue; forms numerous salts (hydrobromate, hydrochlorate, nitrate, sulphate, etc.). *Tests:* 1. Heat with potassa, or other alkalies, or hydrochloric acid, get tropic acid, $C_9H_{10}O_3$, tropine, $C_8H_{15}NO$, and ammonia evolved; on digesting this tropine tropate in acidulated water get atropine reproduced. Other alkaloids (tropeines) can be formed similarly, as tropine mandelate thus yields homatropine, $C_{16}H_{21}NO_3$. 2. With mercuric chloride T. S. get yellow precipitate, soon turning red; with sulphuric acid no color (abs. organic impurities), and nitric acid added to this should cause no color (abs. and dif. from morphine, narcotine, etc.). 3. Aqueous solution + platinic chloride T. S. gives no precipitate (dif. from most alkaloids). 4. With gold chloride T. S. get precipitate which, when crystallized from boiling acidulated (HCl) water, deposits on cooling crystals, forming a yellow, lustreless powder (dif. from hyoscyamine). 5. With sulphuric acid + potassium dichromate get green color, + manganese dioxide should not get blue or purple (dif. from strychnine). Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

FIG. 335.

Belladonna root; transverse section, magnified three diam.

Atropinæ Sulphas, Atropine Sulphate $(C_{17}H_{23}NO_3)_2H_2SO_4$, *official.*—(Syn., Sulphate of Atropia; Fr. Sulfate d'Atropine; Ger. Atropinum Sulfuricum, Schwefelsaures Atropin.) Obtained by dissolving atropine in diluted sulphuric acid, evaporating; occurs in white crystalline powder, odorless, bitter, nauseating taste, soluble in 0.4 part water, 6.2 alcohol, no residue. *Tests:* 1. With sodium carbonate T. S. get white precipitate of atropine, which answers above tests. 2. With barium chloride T. S. get white precipitate insoluble in hydrochloric acid. Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

Homatropine Hydrobromate, $C_{16}H_{21}NO_3HBr$.—Obtained by heating tropine, $C_8H_{15}NO$, with either mendelic (phenyl-glycolic) acid, or oxytoluic (phenyl-acetic) acid, in the presence of hydrochloric acid; add ammonia, shake out homatropine with chloroform, evaporate chloroformic solution, neutralize with hydrobromic acid, crystallize. Occurs in small, white, lustrous crystals; soluble in 10 parts water, 133 alcohol. Used in 1–2 p. c. solutions. Superior to atropine in that it is less toxic, lessens instead of increasing the heart rate, and the effects pass off in one-fourth the time (six hours). Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

Belladonine, $C_{17}H_{23}NO_4$, **Oxyatropine** and **Atropamine (Apoatropine)**, $C_{17}H_{21}NO_2$.—These may all be one and the same; yellow powder very easily decomposed by mineral acids.

Hyoscyamine (daturine, duboisine of other plants).—This has the same formula as atropine and hyoscine, but is more soluble in water, diluted alcohol, and forms gold salts of a different fusing point.

Atrosin.—This is the red coloring matter, fluorescent.

Malic Acid.—This holds the alkaloids in combination.

The young roots contain only hyoscyamine, those of 8–10 years old also atropine; alkaloids are mostly in the bark, hence large woody roots should be rejected.

PREPARATIONS.—I. LEAVES: 1. *Extractum Belladonnæ Foliorum Alcoholicum.* Alcoholic Extract of Belladonna Leaves. (Syn., Fr. Extrait de Belladone alcoolique; Ger. Spirituöses Tollkirschen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s.; yield about 22 p. c. Dose, gr. $\frac{1}{4}$–$\frac{1}{2}$ (.016–.03 Gm.).

Preps.: 1. *Emplastrum Belladonnæ.* Belladonna Plaster. (Syn., Fr. Emplâtre de Belladone; Ger. Belladonna Pflaster.)

Manufacture: Melt resin plaster 40 Gm. + soap plaster 40, adding extract of belladonna 20, heat, stir until homogeneous.

2. *Unguentum Belladonnæ.* Belladonna Ointment. (Syn., Fr. Pomatum cum Extracto Belladonnæ; Ger. Tollkirschensalbe.)

Manufacture: Rub extract of belladonna 10 Gm. with diluted alcohol 5 Cc. until homogeneous, add gradually benzoinated lard 85 Gm., mix thoroughly.

2. *Tinctura Belladonnæ Foliorum.* Tincture of Belladonna Leaves. (Syn., Br. Tinctura Belladonnæ; Fr. Teinture de Belladone; Ger. Belladonnatinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏j–30 (.06–2 Cc.).

II. ROOT: 1. *Extractum Belladonnæ Radicis Fluidum.* Fluid Extract of Belladonna Root. (Syn., Fr. Extrait liquide de Racine de Belladone; Ger. Flüssiges Tollkirschenwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 80 p. c., q. s. 100 Cc. Dose, ♏j–5 (.06–.3 Cc.).

Prep.: 1. *Linimentum Belladonnæ.* Belladonna Liniment. (Syn., Fr. Liniment de Belladone; Ger. Belladonna-Liniment.)

Manufacture: Dissolve camphor 5 Gm. in fluid extract of belladonna q. s. 100 Cc. Used externally.

Unoff. Preps.: I. LEAVES: *Fluid Extract.* Dose, ♏½–3 (.03–.2 Cc.). *Infusion,* 5 p. c. Dose, ʒj–3 (4–12 Cc.). *Succus.* II. ROOT: *Extract.* Dose, gr. ⅛–½ (.008–.03 Gm.). *Abstract.* Dose, gr. $\frac{1}{10}$–1 (.006–.06 Gm.). *Plaster.* *Ointment.*

PROPERTIES.—Sedative, narcotic, diuretic, mydriatic, antispasmodic, anodyne. Like all medicines that act through nervous system; small doses stimulate, large ones paralyze. Diminishes most secretions (salivary, mammary, sudorific, stomach, liver, pancreas, intestines) by paralyzing peripheral nerve endings, increases peristalsis by paralyzing terminations of involuntary intestinal muscles; dilates pupil, increases pulse and urine by paralysis; often causes erythematous eruption; large doses produce within fifteen minutes dilated pupils, dryness of mouth, burning throat and stomach, thirst, difficult deglutition, nausea, vertigo, hallucinations, delirium or fits of laughter, afterwards coma, feeble pulse, cold extremities, convulsions, finally death.

USES.—Lessens pain, rheumatism, gout, neuralgia, sciatica, cancer, pelvic trouble, encephalitis, meningitis, myalitis, erysipelas. Inflammation of lungs, iris, bladder, kidneys, breast, acute catarrh, sore throat, asthma, whooping-cough, spasms, constipation, spermatorrhœa, prophylactic against scarlet fever. Locally in abscesses, carbuncles, skin diseases, scarlet fever rash, to dry milk, relieve pregnant vomit. Smoke leaves with opium for phthisis. Atropine (hypodermic) is the sheet-anchor in poisoning by opium, physostigma, and hydrocyanic acid.

Poisoning: Give emetics or use pump, enemas, tannic acid, then morphine, physostigmine, or pilocarpine (hypodermic) for nervous disturbance; stimulants, brandy, caffeine, strychnine, artificial respiration, cold to head, warmth to feet. Children often eat the sweet fruit in excess and should receive this treatment.

Incompatibles: Muscarine, physostigmine, pilocarpine, aconite, opium, tannin, caustic alkalies (evolve ammonia), quinine.

Synergists: Mydriatic drugs (hyoscyamus, stramonium, duboisia).

Allied Plants:

1. *Mandra'gora officina'lis* (*Atropa mandra'gora*), together with var. *autumna'lis,* having blue flowers, and var. *verna'lis,* white flowers. S. Europe. These are acaulescent plants, having similar constituents as belladonna.

2. *Scopo'l(i)a japo'nica, Japanese Belladonna.*—Rhizome 10 Cm. (4′) long, 12 Mm. (½′) thick; this also yields atropine.

3. *Scopoli'na atropoi'des* (*Scopo'lia atropoi'des* (*carnio'lica*), *Hyoscy'amus Scopo'lia*).—S. Europe, rhizome annulated, tissues same as official root; contains scopolamine (hyoscine), $C_{17}H_{21}NO_4$, scopoletin, $C_{10}H_8O_4$. Scopolamine forms numerous salts, the hydrobromate being in special favor.

SOLANACEÆ.

HYOSCYAMUS. HYOSCYAMUS (HENBANE).

Hyoscyamus niger, *Linné.* } The leaves and flowering tops, collected from plants of the second year's growth.

Habitat. Europe, Asia, waste places, neglected ruins, old gardens, sandy soil; naturalized in N. America (New England to Michigan); cultivated in England, etc.

Syn. Hogs'-bean, Poison Tobacco, Stinking or Fetid Nightshade, Insane-root, Belene, Chenile, Henbell, Black Henbane. Br. Hyoscyami Folia. Fr. Feuilles de Jusquiame noire. Ger. Herba Hyoscyami, Bilsenkraut.

Hy-os-cy′a-mus. L. fr. Gr. *ὑός*, a hog, + *κύαμος*, a bean, hog bean; *i. e.*, its fruit (bean) acts on swine as a poison or intoxicant, but cows, horses, dogs, and goats can tolerate great quantity.

Ni′ger. L. black; *i. e.*, inside throat of flowers purplish-black.

Hen′bane. Hen + bane; i. e., whole plant fatal to poultry—bane to hens.

PLANT.—Biennial herb; stem .6–1.3 M. (2–4°) high, green, rises in second year, covered with long, soft, jointed, glandular, white hairs, viscid, clammy, fetid odor; root large, brown, inside white, resembles parsley, for which it has been eaten by serious mistake, wrinkled, compact, fibrous; flowers May–June, in 5's, numerous, nearly sessile, straw color, urn-shaped (urceolate), calyx 5-toothed, corolla 3 Cm. (1¼′) long, purple net veins and base (throat), anthers and style purple; fruit capsule, pyxis 12 Mm. (½′) thick, globular, 2-celled, dehiscing near the top by a cap, many-seeded; seeds black. LEAVES, ovate, sessile, 5–25 Cm. (2–10′) long, 2.5–10 Cm. (1–4′) wide, lower ones largest, sinuate-toothed, teeth large, triangular, grayish-green, glandular, hairy or woolly, especially underside, midrib prominent; odor heavy, narcotic; taste bitter, somewhat acrid. These should be collected when two-thirds of the flowers are expanded. The plant by cultivation has become so diversified as to give varieties and almost species, all differing somewhat in medical properties. *Solvents:* diluted alcohol; boiling water partially. Dose, gr. 2–10 (.13–.6 Gm.).

ADULTERATIONS.—With leaves of allied species, also of stramonium, digitalis, belladonna, verbascum.

CONSTITUENTS.—Mydriatic alkaloids 0.3 p. c.—Hyoscyamine, Hyoscine, Scopolamine, Hyoscipicrin, choline, mucilage, albumin, potassium nitrate 2 p. c. In the seeds also fixed oil 25 p. c.

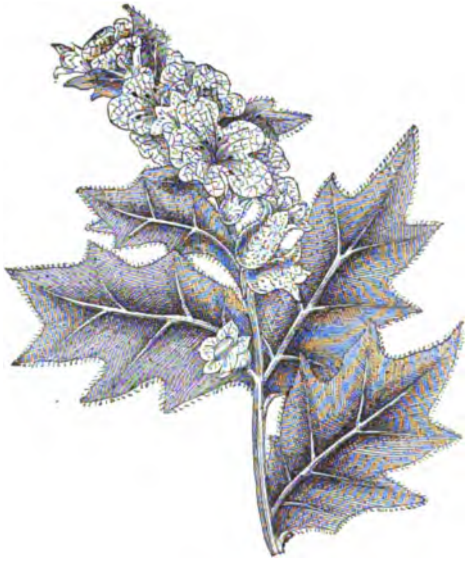
Hyoscyamine, $C_{17}H_{23}NO_3$.—A crystalline alkaloid obtained by exhausting (seed) with alcohol (80 p. c.), recovering same and allowing several days for the residue to separate fatty layer; to filtrate add potassium carbonate to liberate alkaloids, which are now shaken out with ether; evaporate ether when we get a syrupy liquid from which hyoscyamine crystallizes; yield—leaves: 0.042–0.224 p. c.; seed: 0.08–0.16 p. c.; root: 0.006–0.307 p. c. Occurs in white, silky needles, if impure deliquescent, becoming brown; identical with duboisine, isomeric with atropine, into which it is converted by heating to 120° C. (248° F.) for six hours; it also splits into tropine, $C_8H_{15}NO$, and tropic acid, $C_9H_{10}O_3$, and forms numerous salts (hydrobromate, hydrochlorate, sulphate, etc.).

Hyoscyaminæ Hydrobromas, Hyoscyamine Hydrobromate, *official.*—(Syn., Fr. Bromure d'Hyoscyamine; Ger. Hyoscyaminum

Hydrobromicum, Hyoscyaminbromid.) This hydrobromate of the preceding alkaloid is obtained by dissolving hyoscyamine in slight excess of diluted hydrobromic acid, concentrating, crystallizing; it is yellowish-white, amorphous or crystalline, tobacco-odor, taste acrid, nauseous, bitter, deliquescent, soluble in 0.3 part water, 2 alcohol, no residue. *Tests:* 1. Aqueous solution is not precipitated by platinic chloride T. S. (dif. from most alkaloids). 2. With gold chloride T. S. gives precipitate, which when crystallized from boiling acidulated (HCl) water is in minute, lustrous, golden-yellow scales (dif. from atropine). 3. With silver nitrate T. S. get yellowish-white precipitate insoluble in nitric acid, soluble in ammonia. Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

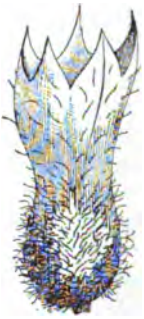
Hyoscyaminæ Sulphas, Hyoscyamine Sulphate, *official.*—(Syn., Fr. Sulfate d'Hyoscyamine; Ger. Hyoscyaminum Sulfuricum, Schwefelsaures Hyoscyamin.) This neutral sulphate is obtained from the preceding alkaloid by dissolving it in diluted sulphuric acid to neutrality, concentrating, crystallizing; it is in white crystals or powder, odorless, bitter, acrid, deliquescent, no residue. *Tests:* 1. With barium chloride T. S. get white precipitate, insoluble in hydrochloric acid. 2. With platinic chloride T. S., and gold chloride T. S. get same as with hydrobromate. Both salts should be kept in well-stoppered vials. Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.).

Fig. 336.



Hyoscyamus niger; flowering branch.

Fig. 337.



Hyoscyamus calyx, containing capsule, natural size.

Hyoscine (Amorphous Hyoscyamine), $C_{17}H_{21}NO_4$.—Obtained from mother-liquor of hyoscyamine, by adding gold chloride, to form a less soluble gold double salt, which crystallizes out, dissolve this in water, remove gold by hydrogen sulphide, precipitate hyoscine with potassium carbonate; it is a tenacious semi-liquid mass, isomeric with hyoscyamine, yields tropic acid and pseudotropine, $C_8H_{15}NO$, and forms numerous salts (hydrobromate, hydrochlorate, sulphate, etc.).

Hyoscinæ Hydrobromas, Hyoscine Hydrobromate, *official.*—(Syn., Fr. Bromure d'Hyoscine; Ger. Hyoscinum Hydrobromicum, Hyoscin-hydrobromid.) This hydrobromate of the preceding alkaloid is obtained by dissolving it in slight excess of diluted hydrobromic acid, concentrating, crystallizing; it occurs in white crystals, odorless, acrid, bitter taste, soluble in 1.9 parts water, 13 alcohol, no residue. *Tests:* 1. With ammonia no change, but with potassa T. S. get white turbidity. 2. With silver nitrate T. S. get yellowish-white precipitate, insoluble in nitric acid, soluble in ammonia. 3. With nitric acid evaporate to dryness, when cold add alcoholic solution of potassa getting violet color. Should be kept in small well-stoppered vials. Dose, gr. $\frac{1}{200}$–$\frac{1}{100}$ (.0003–.0006 Gm.); hypodermically, gr. $\frac{1}{400}$–$\frac{1}{200}$ (.00015–.0003 Gm.).

Scopolamine, $C_{17}H_{21}NO_4$.—Isomeric with hyoscine, amorphous or crystalline, forms useful salts, splits into atropic acid, $C_9H_8O_2$, and scopoline, $C_8H_{13}NO_2$.

Hyoscipicrin, $C_{27}H_{52}O_{14}$.—A neutral, bitter glucoside, soluble in water, alcohol, precipitated by tannin, converted by hydrochloric acid into fermentable sugar, and a yellowish, acrid, bitter resin.

PREPARATIONS.—1. *Extractum Hyoscyami.* Extract of Hyoscyamus. (Syn., Fr. Extrait Alcoolique (de Feuilles) de Jusquiame; Ger. Spirituöses Bilsenkraut-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 200 Cc., water 100 Cc. finishing with diluted alcohol q. s. Dose, gr. ½–2 (.03–.13 Gm.).

2. *Extractum Hyoscyami Fluidum.* Fluid Extract of Hyoscyamus. (Syn., Fr. Extrait liquide de Jusquiame; Ger. Flüssiges Bilsenkraut-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏ij–10 (.13–.6 Cc.).

3. *Tinctura Hyoscyami.* Tincture of Hyoscyamus. (Syn., Fr. Teinture de Jusquiame; Ger. Bilsenkrauttinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

Unoff. Preps.: Abstract (alcohol). Dose, gr. 1–5 (.06–.3 Gm.). *Infusion,* 5 p. c. Dose, ʒj–3 (4–12 Cc.). *Oleum Hyoscyami Infusum* (leaves 1, alcohol 2, olive oil 20); use externally. *Baume Tranquille* (leaves of hyoscyamus, stramonium, belladonna, tobacco, poppy, black nightshade, āā 40 parts + aromatic herbs twelve kinds āā 10 + olive oil 1,000); use externally.

PROPERTIES.—Anodyne, hypnotic, narcotic, mydriatic, laxative, carminate, similar to belladonna, stramonium and duboisia, but less powerful and irritating, yet the most calmative and hypnotic of the group, sedative to urinary tract. Hyoscyamine is less active than atropine; it is more an anodyne or anæsthetic than narcotic or soporific, depresses spine, but excites cerebral function. Hyoscine is much stronger than hyoscyamine, being a powerful cerebral and spinal sedative; lessens pulse and respiration, habitually used produces muscular paralysis, violent delirium.

USES.—Mostly with children, and where opium is contraindicated; acute and chronic mania, delusive insanity, insomnia with hallucinations, delirium tremens, monomania of hypochondriacs, whooping-cough, nervous cough, colics, tremor in paralysis, mercurial poisoning, locomotor ataxia, irritation of bladder, constipation, chorea, tetanus, morphine habit, corrective to griping and nauseating medicine.

Poisoning: Same as belladonna; but for hyoscine use chiefly chloral hydrate.

Incompatibles, Synergists: Same as in belladonna.

Hyoscyami Semen.—Official, 1830–1880. These are stronger than leaves, and used mostly for extraction of alkaloids; they are roundish, reniform, flattened, 1–1.5 Mm. ($\frac{1}{25}$–$\frac{1}{16}$′) long, testa finely pitted, grayish-brown, sharp near the raised portion (distinction from stramonium seed), inodorous, taste oily, bitter, acrid. Dose, gr. 1–5 (.06–.3 Gm.).

Allied Plants:

1. *H. pa'llidus.*—Flowers are pale-yellow and have no purple (*niger*) veins in the corolla. *H. agre'stis* (of the field, wild); small annual, .3 M. (1°) high, less villous, with leaves smaller, and fewer flowers. *H. a'lbus* and *H. au'reus*, the former with white flowers; the latter with golden-yellow, both less active than the official.

2. *Duboi'sia myoporoi'des.*—Australia. Small tree having similar properties to belladonna and hyoscyamus; leaves 7.5–10 Cm. (3–4′) long, 12–25 Mm. (½–1′) broad, petiolate, midrib prominent, entire, taste bitter; contain duboisine 0.3–1 p. c., a volatile alkaloid (mixture of hyoscyamine, scopolamine and atropine), which forms numerous salts. Dose of leaves, gr. 1–3 (.06–.2 Gm.), duboisine hydrobromate, or sulphate, $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.); use externally, for eye troubles in solution (1 p. c. in water).

STRAMONIUM. STRAMONIUM (THORN-APPLE).

1. STRAMONII FOLIA. Stramonium Leaves.
2. STRAMONII SEMEN. Stramonium Seed.

Datura Stramonium, *Linné.* } The leaves and seed.

Habitat. Asia; naturalized universally (Europe, England, N. America, etc.).

Syn. Devil's or Mad Apple, Jamestown-, Jimsun-, Jimpson- or Stink-weed, Stinkwort, Devil's Trumpet, Fire-weed, Jamestown Lily, Dewtry, Apple of Peru. Fr. Stramoine, Pomme Épineuse, Feuilles de Stramoine, Semences (Graines) de Stramoine. Ger. Stechapfel, Dornapfel, Stechapfelblätter, Stechapfelsamen.

Da-tu'ra. L. alteration of Ar. name of the plant *tatorah*, or Hind. *dhatura; tatula* is altered from *datula*, its name as given by Turks and Persians.

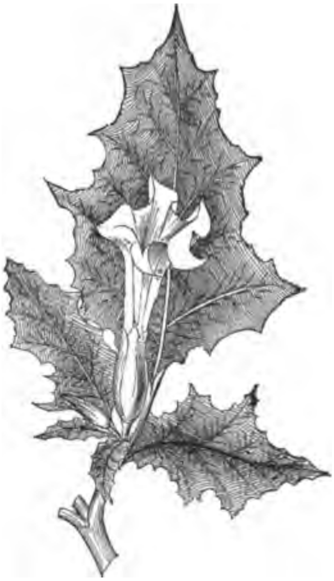
Stra-mo'ni-um. L. contr. of Gr. *στρύκνον μανικὸν*, used by Dioscorides for this and for *Atropa Belladonna.*

Jimson-weed. For Jamestown, Va., where first found growing on ship rubbish.

SOLANACEÆ.

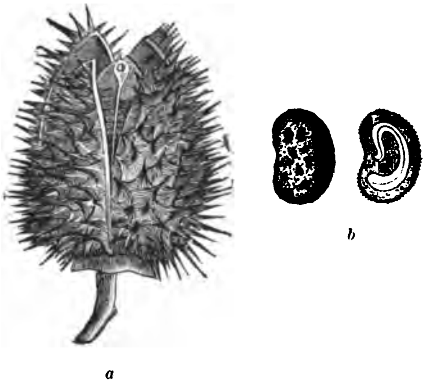
Plant.—Coarse annual herb, bushy, rank odor, noxious, infesting fields, roadsides, waste places, near houses, never in mountains or woods; stem green, succulent, nearly solid, 1–1.5 M. (3–5°) high, 2.5–4 Cm. (1–1$\frac{1}{2}$′) thick, dividing into 2–3 branches above the ground; root tapering, white; flowers June–Sept., solitary, calyx 5's, tubular, green, 4 Cm. (1$\frac{1}{2}$′) long; corolla 5's, tubular or funnel-shaped, 7.5–10 Cm. (3–4′) long, 5 Cm. (2′) wide, white; fruit capsule 5 Cm. (2′) long, ovate, obtusely quadrangular, covered with unequal, sharp, rigid spines, 4-celled, dehiscing half way down into 4 segments; ovary 2-carpelled, 2-celled. **Leaves**, 10–25 Cm. (4–10′) long, 7.5–15 Cm. (3–6′) wide, petiolate, dark-green above, lighter underneath, smooth, ovate, unequal at base, coarsely incised, acuminate, thin, brittle; nearly inodorous when dry; taste unpleasant, bitter, nauseous. Dose, gr. 1–5 (.06–.3 Gm.). **Seed**, 5 Mm. ($\frac{1}{5}$′) long, 2.5 Mm. ($\frac{1}{10}$′) broad, 1 Mm. ($\frac{1}{25}$′) thick, reniform, flattened, angled, brownish-black, hard, pitted, wrinkled, embryo curved, imbedded in a whitish, oily perisperm; odor unpleasant when bruised; taste oily, bitter. *Solvents:* alcohol (75 p. c.), or diluted alcohol; hot water partially. Dose, gr. 1–3 (.06–.2 Gm.).

Fig. 338.



Datura Stramonium; flowering branch.

Fig. 339.



Datura Stramonium; *a*, fruit; *b*, stramonium seed and section, magnified three diam.

Commercial.—Plant was possibly unknown to the ancients, was described by Gerarde in sixteenth century, and introduced into medicine by Störck in 1672. Gypsies brought leaves and seeds from Asia into Europe in the middle ages, using the smoke therefrom to intoxicate and delude their dupes. All parts are medicinal, and the plant grows well with us, especially in Michigan and other Western States.

Leaves should be gathered during flowering, by pulling up entire plant, then quickly removing and drying them, when they are frequently broken or cut into pieces.

Seeds should be taken from fruit in late autumn; these are collected while of green color, but mature, then dried some days, when they dehisce, allowing seeds to be shaken out; they are now further dried and are much stronger than the leaves.

CONSTITUENTS.—I. LEAVES: Daturine 0.2 p. c., mucilage, albumin, potassium nitrate, ash 17 p. c. II. SEED: Daturine 0.3 p. c., scopolamine (hyoscine), fixed oil 25 p. c., malic acid, resin, mucilage, proteids, ash 3 p. c.

Daturine.—An alkaloid combined with malic (daturic) acid, and consists of hyoscyamine and atropine, the former usually predominating, forms salts (hydrochlorate, sulphate, etc.). Dose, gr. $\frac{1}{120}$–$\frac{1}{60}$ (.0005–.001 Gm.). The oil contains daturic acid, $C_{17}H_{34}O_2$.

PREPARATIONS.—1. *Extractum Stramonii Seminis.* Extract of Stramonium Seed. (Syn., Br. Extractum Stramonii, Extract of Stramonium; Fr. Extrait de Semences de Stramoine; Ger. Stechapfelsamen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. Dose, gr. $\frac{1}{6}$–$\frac{1}{2}$ (.01–.03 Gm.).

Prep.: 1. *Unguentum Stramonii.* Stramonium Ointment. (Syn., Fr. Pommade de Stramoine; Ger. Stechapfelsalbe.)

Manufacture: Rub extract of stramonium seed 10 Gm. with diluted alcohol 5 Cc. until homogeneous, add gradually benzoinated lard 85 Gm., mix thoroughly.

2. *Extractum Stramonii Seminis Fluidum.* Fluid Extract of Stramonium Seed. (Syn., Extractum Stramonii Fluidum; Fr. Extrait liquide de Semences de Stramoine. Ger. Flüssiges Stechapfelsamen-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏j–5 (.06–.3 Cc.).

3. *Tinctura Stramonii Seminis.* Tincture of Stramonium Seed. (Syn., Br. Tinctura Stramonii, Tincture of Stramonium; Fr. Teinture de Semences de Stramoine; Ger. Stechapfelsamentinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Unoff. Preps.: I. LEAVES: *Fluid Extract.* Dose, ♏j–5 (.06–.3 Cc.). *Extract.* Dose, gr. $\frac{1}{4}$–1 (.016–.06 Gm.). *Succus, Plaster, Ointment, Cigarettes.* II. ROOT: *Plaster, Fomentation.*

PROPERTIES.—Narcotic, anodyne, antispasmodic, diuretic, mydriatic. Internally very similar but stronger than belladonna; weaker externally. Large doses produce dry throat, cardiac irregularity, high fever with delirium, sexual desire, possibly laughing and hallucinations (like in cholera, alcoholism), dizziness, fainting, red eruptions, dilated pupils, insomnia; pneumogastric becomes paralyzed, thus stopping the inhibitory action, hence whole system paralyzed finally by over-stimulation, including the heart, then delirium, stupor, convulsions, death by asphyxia; in case of recovery remember nothing except all black objects appear green; does not affect some animals, as caterpillar tribe, goats, etc.

Uses.—Insanity, mania, melancholia, epilepsy, nervous asthma (gr. 15 (1 Gm.) of leaves smoked with tobacco or sage at each paroxysm), whooping-cough, dysmenorrhœa, retention of urine, hepatic colic, laryngeal cough, chorea. Ointment in ulcers, hemorrhoids, fissures, skin diseases, poison-oak eruptions, rheumatism, bruises, sprains. In the absence of belladonna may use stramonium with good results.

Poisoning, Incompatibles, Synergists: Same as for belladonna.

Allied Plants:

1. *D. Ta'tula, Purple Thorn-Apple.*—Thought by some the same as *D. Stramonium*, but has purple stems and corolla. *D. fastuo'sa* (*a'lba*). India. Their criminal poison; capsule small, subglobular, spinous, seeds yellowish-brown, triangular, rough. *D. Me'tel, Entire-leaved Thorn-Apple.* Africa, S. Asia. Capsule and seeds like *D. fastuosa* (*alba*), leaves nearly entire, downy. *D. sangui'nea.* Peru. Large shrub or tree, leaves nearly entire, downy beneath, flowers large, upper half of corolla yellow, lower half blood-red.

2. *Fabia'na imbrica'ta, Pichi.*—Peru, Chili. Plant the height of a man, growing on rocky hill-tops resembling the pines somewhat; the woody branches are used, being resinous, with aromatic odor and taste; contain fabianine, resin, volatile oil. Diuretic, tonic, cholagogue; chronic vesical catarrh, gravel, renal, urethral, or cystic calculi. Should not be used in organic disease. Dose, gr. 5–40 (.3–2.6 Gm.).

TABACUM. TOBACCO.

Nicotiana Tabacum, *Linné.* } The commercial dried leaves.

Habitat. Tropical America (C. and S. America); cultivated.

Syn. Virginia Tobacco, Drunkwort. Br. Tabaci Folia, Leaf Tobacco. Fr. Nicotiane, Tabac. Ger. Folia Nicotianæ, Tabakblätter, Tabak.

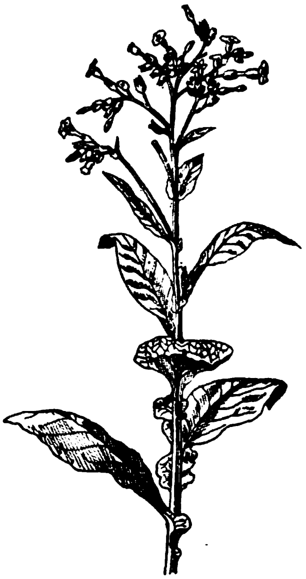
Ni-co-ti-a'na. L. in honor of Jean Nicot, French Ambassador at Lisbon, who procured the first seeds from a Dutchman arriving from Florida, and in 1560 brought the plant thence to France.

Tab-a'cum. L. for Tobacco; *i. e.*, native word meaning "pipe or tube"; or said brought first to England from *Tobago*, W. Indies, or from *Tobasco*, in Mexico, whence the name by Sir Ralph Lane, 1586.

Plant.—Coarse robust annual, 1–2 M. (3–6°) high; stem erect, unbranched, solid, green, thickly set with soft, viscid hairs; root long, tapering, fibrous; flowers July, rose-colored, calyx bell-shaped, hairy, viscid, greenish, corolla 4–5 Cm. (1½–2′) long, tubular, inflated; fruit, capsule 2.5 Cm. (1′) long, ovate, 2-valved, 2-celled, opening at summit, seeds many, reniform, pale-brown, testa reticulate. Leaves, about .5 M. (20′) long, 10–15 Cm. (4–6′) wide, ovate-lanceolate, acute, entire, waved, brown, friable, glandular-hairy; odor heavy, peculiar, taste nauseous, bitter, acrid. *Solvents:* alcohol; hot water (injured by boiling). Dose, gr. ½–3 (.03–.2 Gm.).

Commercial.—Tobacco is not known in the wild state. It was found under cultivation in Holland in 1615, and other countries somewhat later; it now grows in most subtropical regions, requiring rich soil and yearly manuring. The seeds are sown in beds, and the young plants, 12.5–25 Cm. (5–10′) high, are set out (May) in fields, forming hills, .6–1 M. (2–3°) apart. These must be carefully cultivated, like corn, to keep down grass, pernicious insects, etc.; before flowers expand the flowering tops are broken off, and when leaves mature (Sept.) the entire plants are cut off near the ground, allowed to wilt in the sun and cured by hanging in drying houses—here they "sweat," but become dry in a few weeks, then they are taken from stems, assorted, tied into bundles and packed in boxes or hogsheads. There are many varieties derived from places of growth, Conn., Pa., Va., Md., Ohio, Cuba, Havana, etc., and any of these may be in color light or dark, and in form made into plug, granulated, long-cut, snuff, etc. In curing, as outlined, the leaves undergo chemical changes, the odor becomes different, due to generation of a new volatile principle; the amount of nicotine decreases slightly, due to its volatility.

FIG. 340.



Nicotiana Tabacum.

CONSTITUENTS.—Nicotine 0.7–5 to 11 p. c. Nicotianin, resin, albumin, gum, extractive, malates, citrates, ash 14–18 seldom 27 p. c. (Ca, K, NH_4,—phosphates, sulphates, chlorides, nitrates).

Nicotine, $C_{10}H_{14}N_2$.—This poisonous alkaloid, in the plant combined with acid, is obtained by adding excess of potassa to concentrated infusion, made with acidified water, shaking with ether to dissolve alkaloid, adding oxalic acid to form nicotine oxalate, which being insoluble in ether, is precipitated; or evaporate ether, neutralize with oxalic acid, evaporate to dryness, exhaust residue with boiling alcohol to dissolve nicotine oxalate, evaporate to syrup, agitate with potassa and ether, fractionally distil the ethereal liquid to obtain alkaloid, which is a colorless oily liquid, sp. gr. 1.011, pungently acrid, turns brown rapidly, soluble in water, alcohol, ether; violet with hydrochloric acid; brown by chlorine; forms several crystalline salts (hydrochlorate, tartrate, etc.). Dose, gr. $\frac{1}{60}$–$\frac{1}{20}$ (.001–.003 Gm.).

Nicotianin, $C_{23}H_{32}N_2O_3$.—Obtained by distilling tobacco with water, from which it separates in white scales with odor of tobacco smoke, taste warm, camphoraceous, bitter; thought to be a fatty acid + volatile oil; by distilling with potassa get nicotine. Tobacco smoke contains many pyridine bases—creosote, hydrocyanic acid, etc., and some claim nicotine.

Preparations.—(Unoff.) *Aqueous Extract, Fluid Extract, Infusion, Ointment, Poultice, Wine,* 10 p. c. Dose, ♏v–60 (.3–4 Cc.). *Enema Tabaci,* 5 p. c.

Properties.—Narcotic, sedative, diuretic, emetic, diaphoretic, cathartic, antiseptic. It first stimulates (causing convulsions) then paralyzes the motor nervous system (spine), produces vomiting, purging, extreme collapse, contracted pupils, depressed then increased heart action (rapid, feeble pulse), dizziness, weakness, labored breathing, sweating, clammy skin, cold extremities, death by paralysis of respiration and heart; nicotine almost as rapid in action as hydrocyanic acid, death having occurred within three minutes with no symptoms save a wild stare and a deep sigh. The excessive use of tobacco causes dyspepsia, less sexual power, nervousness, angina pectoris, and impairs body nutrition in the young.

Uses.—Too severe for a medicine, hence little employed. Formerly used by our Indians, while mainly now to relax spasms, relieve local pain, constipation, spasmodic asthma, dropsy, tetanus, as enema in intussusception, strangulated hernia, impacted cæcum, hemorrhoids, scabies, urticaria, gout, rheumatism, strychnine poisoning, ascarides, lumbricoid worms. The moderate use of tobacco aids the support of the system, lessens fatigue, loosens bowels, and gr. 5–6 (.3–.4 Gm.) will usually vomit, even the smoke having this latter effect on some persons; nicotine (owing to its severe depression, etc.) should not be given internally, except in strychnine poisoning.

Poisoning: Give tannin followed by emetics; then strychnine (its physiological antidote), alcohol, ammonia, ergot, digitalis, belladonna, iodides, artificial respiration; maintain recumbent position.

Allied Plants:

1. *N. ru'stica, Wild Tobacco* and *N. quadriva'lvis,* Canada, Eastern U. S. *N. repa'nda,* Cuba. *N. pe'rsica,* Persia. *N. ru'stica,* cultivated in Turkey, India, etc.; all can be used similarly.
2. *Oleum Tabaci.*—Obtained by distilling leaves with water (above 100° C.; 212° F.); it is an acrid, poisonous, dark-brown oily liquid, heavy empyreumatic odor, containing nicotine, and is similar to the black tarry substance found in smoking pipes.

77. SCROPHULARIACEÆ. Figwort Family.

Skrof-u-la-ri-a'se-e. L. *Scrophulari-a* + aceæ; *i. e.,* from its efficacy in scrofula. Herbs, rarely shrubs. Distinguished by stamens 2–4–5, didynamous or 2 perfect, inserted on 2-lipped corolla-tube; flowers irregular, 4–5's, 2-lipped; ovary 2-celled, central placenta, superior, style 1; seeds many in fleshy albumin; fruit, capsule or berry; universal; bitter, astringent, emetic, purgative, diuretic, narcotic, poisonous, often cultivated for beautiful flowers.

Genera : 1. **Leptandra** (**Veronica**). 2. **Digitalis**.

LEPTANDRA. LEPTANDRA (CULVER'S ROOT).

Leptandra virginica, (*Linné*) *Nuttall.* } The rhizome and roots.
(**Veronica virginica,** *Linné.*)

Habitat. N. America (Canada to Georgia to Minnesota, in low grounds).

Syn. Culver's Physic, Bowman's-, Beaumont-, Brinton-, Physic or Black-root, Oxadoddy, Purple Leptandra, Tall Speedwell or Veronica, Whorlywort Hini, Quital. Fr. Racine (de Leptandra) de Véronique de Virginie. Ger. Leptandrawurzel.

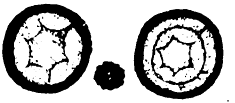
Lep-tan'dra. L. fr. Gr. *λεπτός*, thin, slender, + *ανδρός*, stamen ; *i. e.*, its two slender stamens.

Vir-gin'i-ca. L. Virginian ; *i. e.*, formerly its southern limit of growth.

Ve-ron'i-ca. L. fr. Gr. *φέρειν*, to bear, + *νικη*, victory, or L. *vera*, + Gr. *εικών*, image ; *i. e.*, flower of St. Veronica, which was thought to resemble Christ's face.

PLANT.—Perennial herb ; stem .6–2 M. (2–6°) high, angular, smooth or downy ; leaves 7.5–10 Cm. (3–4′) long, in whorls of 4–7, lanceolate, pointed, serrate ; flowers July–August, small, whitish, tubular, stamens 2, much exserted, spikes 15–30 Cm. (6–12′) long ; fruit small, oblong, compressed capsule, opening by 4 teeth, 2-celled, many-seeded. RHIZOME, horizontal, 10–15 Cm. (4–6′) long, 6 Mm. (¼′) thick, flattened, bent, branched, blackish-brown, scars cup-shaped on upper side, hard, fracture woody, bark thin, blackish, wood yellowish, pith large, purplish-brown, 6-rayed ; roots thin, wrinkled, fragile ; inodorous, bitter, acrid. *Solvents:* alcohol (75 p. c.), or water. Dose, gr. 15–60 (1–4 Gm.).

FIG. 341.



Leptandra virginica ; transverse sections of rhizome and root.

Commercial.—Dr. Culver, after whom the root is named, used it extensively in his practice, so that it was one of our early popular American drugs ; it prefers mountain valleys, meadows, rich woodlands, and is often cultivated in gardens for its beautiful flowers, which vary from white, flesh to purple color.

CONSTITUENTS.—Leptandrin, resin 6 p. c., saponin, tannin, mannit, gum, citric acid, possibly a volatile alkaloid.

Leptandrin.—Obtained by precipitating infusion with lead subacetate, filtering, removing excess of lead with sodium carbonate, passing filtrate through animal charcoal-column to absorb active constituents, washing charcoal with water until bitterness reached ; then treating with boiling alcohol, evaporating. To purify dissolve in ether, evaporate, getting needle-shaped crystals, which are bitter, soluble in water, alcohol, ether, not precipitated by lead subacetate. The "Eclectic" resinoid, *leptandrin*, made by precipitating concentrated alcoholic tincture with water, owes its virtues to the accidental presence of true leptandrin, as the resin is considered inert ; it is but an alcoholic extract, the mother-liquor of which contains some activity along with mannit. Dose, gr. 1–5 (.06–.3 Gm.).

PREPARATIONS.—1. *Extractum Leptandræ.* Extract of Leptandra. (Syn., Fr. Extrait de Leptandra ; Ger. Leptandra(wurzel)-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. Dose, gr. 1–5 (.06–.3 Gm.).

Prep.: 1. *Pilulæ Catharticæ Vegetabiles.* Extract of leptandra ¼ gr. (.016 Gm.) in each pill. Dose, 1–3 pills.

2. *Extractum Leptandræ Fluidum.* Fluid Extract of Leptandra. (Syn., Fr. Extrait liquide de Leptandra; Ger. Flüssiges Leptandra-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Tincture, 10 p. c. (alcohol). Dose, ʒj–2 (4–8 Cc.).

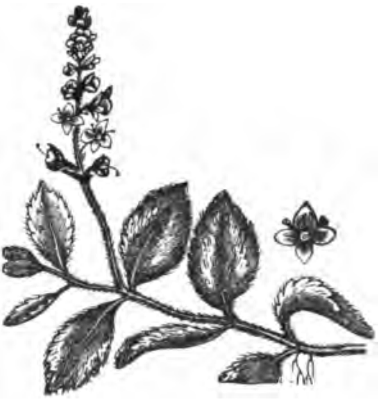
PROPERTIES.—Emeto-cathartic, cholagogue, alterative, tonic.

USES.—Duodenal indigestion, chronic constipation with insufficiency of biliary and intestinal secretions. Leptandrin resembles podophyllin closely in action. Fresh root acts violently on some persons; it is not believed to affect the liver to any appreciable extent.

Allied Plants:

1. *Veron'ica officina'lis, Common Speedwell.*—N. America. Procumbent, pubescent, perennial, stem ascending, 7.5–25 Cm. (3–10′) high; leaves obovate, petioled, 2–4 Cm. (¾–1½′) long, serrate, grayish-green; flowers axillary racemes, wheel-shaped, 4-parted, pale-blue corolla with dark-blue stripes, 2 exserted stamens; contains bitter principle, tannin; plant used as alterative, diuretic (urinary, calculous disorders), diaphoretic, expectorant (skin troubles, scurvy); in infusion. Dose, gr. 30–60 (2–4 Gm.).

FIG. 342.



Veronica officinalis; flowering branch.

2. *Scrophula'ria nodo'sa, Figwort.*—N. America. Perennial plant growing in damp places, 1.2–1.5 M. (4–5°) high, stem obtusely angled, rhizome fleshy having attached many oval tubers size of the thumb, leaves opposite, serrate; bruised when fresh emits an unpleasant, fetid odor; contains scrophularin, tannin; alterative, diuretic, anodyne in hepatic troubles, scrofula, dropsy, eczema, itch, hemorrhoids, anal ulcers, unhealthy sores, etc. Dose, gr. 30–60 (2–4 Gm.).

3. *Chelo'ne gla'bra, Balmony, Snake-head.*—United States. Perennial plant growing in damp places, .6–1 M. (2–3°) high; leaves opposite, oblong-lanceolate, serrate, 7.5–15 Cm. (3–6′) long, flowers white, faintly pink, 2.5 Cm. (1′) long, short, dense, terminal spike; contains bitter principle; tonic, laxative, anthelmintic, jaundice, liver trouble; eczema, and skin troubles externally. Dose, ʒss–2 (2–8 Cc.), in decoction.

RECAPITULATION NO. 9.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Asclepiadaceæ: 1. Asclepias. 2. Asclepias (Pleurisy Root).	Asclepias tuberosa.	The root.	N. America.	Glucoside, resins, mucilage, tannin.	Fluid extract.	Diaphoretic, expectorant, carminative, diuretic, anodyne.	Pleurisy, pneumonia, asthma, consumption, rheumatism, colic, dyspepsia, scrofula, ulcers.	15–60 (1–4 Gm.)
Convolvulaceæ: 1. Jalapa. 2. Jalap.	Exogonium purga (Ipomœa Jalapa).	The tuberous root.	East Mexico.	Resin (jalapin and jalapurgin), starch, gum.	Extract, comp. powder, resin, comp. cath. pills, veg. cath. pills.	Hydragogue cathartic, diuretic.	Constipation, dropsy, fevers, inflammations, head troubles.	5-20 (.3–1.3 Gm.)
1. Scammonium. 2. Scammony.	Convolvulus Scammonia.	The resinous exudation.	W. Asia.	Resin, gum.	Resin, extr. colocynth comp.	Hydragogue, cholagogue cathartic.	Dropsies, cerebral affections, torpid intestines.	1–5–10 (.06–.3–.6 Gm.)
Hydrophyllaceæ: 1. Eriodictyon. 2. Eriodictyon.	Eriodictyon californicum (glutinosum).	The leaves.	California.	Volatile oil, resin, eriodictyonic acid.	Fluid extract.	Expectorant, bitter tonic, stimulant.	Bronchitis, asthma, to disguise quinine taste.	30–60 (2–4 Gm.)
Labiatæ: 1. Scutellaria. 2. Scutellaria (Scullcap).	Scutellaria lateriflora.	The herb.	N. America.	Volatile oil, tannin, bitter principle, sugar.	Fluid extract.	Tonic, nervine, antispasmodic.	Hysteria, epilepsy, nervousness, chorea, neuralgia, intermittents.	30–60 (2–4 Gm.)
1. Marrubium. 2. Marrubium (Horehound).	Marrubium vulgare.	The leaves and tops.	Europe, C. Asia.	Volatile oil, marrubiin, tannin, resin.	....	Stimulant, tonic, deobstruent, anthelmintic.	Dyspepsia, bronchitis, jaundice, amenorrhœa, phthisis, rheumatism.	30–60 (2–4 Gm.)
1. Salvia. 2. Salvia (Sage).	Salvia officinalis.	The leaves.	S. Europe.	Volatile oil, resin, tannin, extractive.	....	Stimulant, tonic, astringent, vulnerary.	Dyspepsia, sweats, ulcers of mouth, sores, nasal catarrh, sore-throat.	15–60 (1–4 Gm.)
1. Hedeoma. 2. Hedeoma (American Pennyroyal).	Hedeoma pulegioides.	The leaves and tops.	N. America.	Volatile oil, tannin, bitter principle.	Oil.	Stimulant, carminative, emmenagogue.	Colic, nausea, indigestion, diarrhœa, rheumatism, amenorrhœa.	15–60 (1–4 Gm.)
1. Melissa. 2. Melissa (Balm).	Melissa officinalis.	The leaves and tops.	Asia Minor, S. Europe.	Volatile oil, tannin, bitter principle.	....	Carminative, diaphoretic, stimulant.	Febrile affections, also to act on the skin.	15–60 (1–4 Gm.)
1. Oleum Thymi. 2. Oil of Thyme.	Thymus vulgaris.	The volatile oil.	S. Europe.	Cymene, thymene, thymol.	Thymol.	Stimulant, tonic, emmenagogue, antispasmodic, antiseptic.	Chlorosis, rheumatism, neuralgia, bronchitis, diarrhœa, gleet, vesical catarrh.	Minims. 1–5 (.06–.3 Cc.)
1. Mentha Viridis. 2. Spearmint.	Mentha spicata (viridis).	The leaves and tops.	Europe, N. America.	Volatile oil, resin, tannin, gum.	Spirit, *Oil:* water, spirit.	Carminative, stimulant, nervine.	Cholera infantum, culinary and confectionery purposes, perfume.	Grains. 30–60 (2–4 Gm.)

1. Mentha Piperita. 2. Peppermint.	Mentha piperita.	The leaves and tops.	Asia, Europe, N. America.	Volatile oil, resin, tannin, gum.	Spirit, *Oil:* water, spirit, troches, pil. rhei comp., rhei and soda mixture, menthol.	Carminative, stimulant, nervine, antispasmodic.	Flatulence, colic, nausea, diarrhœa, headache, dysmenorrhœa, rheumatism, toothache.	15–60 (1–4 Gm.)
1. Oleum Lavandulæ Florum. 2. Oil of Lavender Flowers.	Lavandula angustifolia (officinalis).	The volatile oil.	S. Europe.	Terpene, $C_{10}H_{16}$, geraniol, linalool, $C_{10}H_{18}O$.	Spirit, comp. tinct., Fowler's solution.	Stimulant, carminative, nervine, errhine.	Gastralgia, nausea, headache, flatulence, perfumery.	Minims. 1–5 (.06–.3 Cc.)
1. Oleum Rosmarini. 2. Oil of Rosemary.	Rosmarinus officinalis.	The volatile oil.	S. Europe, Med. Basin.	Pinene, camphor borneol, cineol.	Soap liniment, tinct. lavender comp.	Carminative, stimulant, diuretic, diaphoretic.	Colic, nervousness, menstrual troubles, rheumatism, sprains.	1–5 (.06–.3 Cc.)
Solanaceæ:								Grains.
1. Dulcamara. 2. Dulcamara (Bittersweet).	Solanum Dulcamara.	The young branches.	Europe, Asia.	Dulcamarin, solanine, resin, gum, starch, calcium lactate.	Fluid extract.	Narcotic, diuretic, diaphoretic, alterative.	Eczema, rheumatism, bronchitis, catarrhs, gout, diarrhœa.	30–60 (2–4 Gm.)
1. Capsicum. 2. Capsicum (Cayenne or African Pepper).	Capsicum fastigiatum.	The fruit.	S. and C. America.	Capsaicin, fixed oil, volatile oil, resin, capsicine.	Fluid extr., oleoresin, tincture, plaster.	Stimulant, stomachic, diaphoretic, rubefacient.	Dyspepsia, colic, cholera, diphtheria, menorrhagia, rheumatism, relaxed uvula, lumbago.	1–8 (.06–.5 Gm.)
1. Belladonnæ Folia. 2. Belladonna Leaves.	Atropa Belladonna.	The leaves.	C. and S. Europe.	Atropine, belladonnine, hyoscyamine, atropamine, atrosin, malic acid, starch.	Alc. extr., plaster, ointment, tinct.	Sedative, narcotic, mydriatic, antispasmodic, anodyne.	Rheumatism, neuralgia, sciatica, cancer, meningitis, erysipelas, asthma, coughs, spasms, scarlet fever, abscesses, eczema, phthisis.	½–3 (.03–.2 Gm.)
1. Belladonnæ Radix. 2. Belladonna Root.		The root.			Fld. extr., liniment, atropine, atropine sulphate.			½–2 (.03–.13 Gm.)
1. Hyoscyamus. 2. Hyoscyamus (Henbane).	Hyoscyamus niger.	The leaves and flowering tops.	Europe, Asia.	Hyoscyamine, hyoscine, scopolamine, choline, hyoscipicrin.	Extr., fld. extr., tincture, hyoscyamine hydrobromate and sulphate, hyoscine hydrobromate.	Anodyne, hypnotic, narcotic, mydriatic, laxative, carminative.	Mania, insomnia, insanity, coughs, colic, tremor in paralysis, bladder trouble, constipation, chorea, tetanus.	2–10 (.13–.6 Gm.)
1. Stramonii Folia. 2. Stramonium Leaves.	Datura Stramonium.	The leaves.	Asia.	Daturine, mucilage, KNO_3.	Extract, ointment, fld. extr., tinct.	Narcotic, anodyne, antispasmodic, diuretic, mydriatic.	Insanity, mania, epilepsy, asthma, whooping-cough, rheumat., dysmenorrhœa, chorea, sprains, ulcers, hemorrhoids, eczema.	1–5 (.06–.3 Gm.)
1. Stramonii Semen. 2. Stramonium Seed.		The seed.	....	Daturine, fixed oil, malic acid, resin, proteids, mucilage.				1–3 (.06–.2 Gm.)
1. Tabacum. 2. Tobacco.	Nicotiana Tabacum.	The commercial dried leaves.	Tropical America.	Nicotine, nicotianin, resin, malates, citrates, albumin.	....	Narcotic, sedative, diuretic, emetic, diaphoretic, cathartic, antiseptic.	Constipation, asthma, dropsy, tetanus, hernia, hemorrhoids, scabies, rheumatism, worms.	¼–3 (.03–.2 Gm.)
Scrophulariaceæ:								
1. Leptandra. 2. Leptandra (Culver's Root).	Leptandra (Veronica) virginica.	The rhizome and roots.	N. America.	Leptandrin, resin, saponin, tannin, alkaloid(?), mannit.	Extr., fld. extr., pill cath. veg.	Emeto-cathartic, tonic, cholagogue, alterative.	Indigestion, constipation.	15–60 (1–4 Gm.)

DIGITALIS. DIGITALIS (FOXGLOVE).

Digitalis purpurea, *Linné.* } The leaves, collected from plants of the second year's growth.

Habitat. S. and C. Europe, sandy soil, edges of woods, thickets.

Syn. Fairy Gloves, Folks or Ladies' Glove, Dog's Finger, Fairy Fingers, Dead Men's Bells, Finger Flower, Purple or American Foxglove, Thimbles, Fairy Cup, Lion's Mouth, Scotch Mercury, Throatwort, Rabbit's-flower. Br. Digitalis Folia. Fr. Feuilles de Digitale pourprée (de grande Digitale), Doigtier. Ger. Fingerhutblätter.

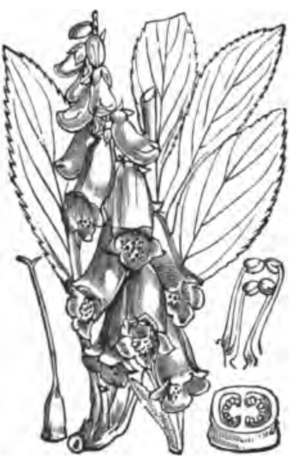
Dig-i-ta'lis. L. pertaining to the fingers, fr. *digitus*, a finger; *i. e.*, the finger-shaped corolla, named by Fuchs, 1542, after Ger. *fingerhut*, a thimble.

Pur-pu're-a. L. *purpureus*, purple-colored; *i. e.*, its purple flowers.

Foxglove. Corruption of *Folks' glove*, *Folk*, synonym of *Fairies*.

PLANT.—Biennial herb, cultivated for ornament and medicine; stem .6–1.5 M. (2–5°) high, succulent, downy, leafy; flowers July–Aug., tubular, bell-shaped, 5-lobed, outside purple, inside sprinkled with black spots upon a white ground, mouth hairy, terminal racemes; one variety has white flowers; seeds small, numerous, brownish-gray in a 2-celled pyramidal capsule. LEAVES, 10–30 Cm. (4–12′) long, ovate, contracted at base into a petiole 10–15 Cm. (4–6′) long, crenate, dull-green, downy, wrinkled above, paler, reticulate, densely pubescent beneath, midrib broad near the base; odor slight, tea-like; taste bitter, nauseous, leaves are smaller at nearing the summit, and those of cultivation less hairy. *Solvents:* alcohol (65 p. c.); boiling water partially. Dose, gr. 1–2 (.06–.13 Gm.).

FIG. 343.

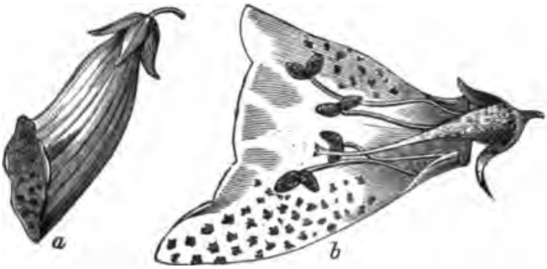


Digitalis purpurea.

ADULTERATIONS. — 1. The first year's leaves of official plant. 2. *D. ochroleu'ca;* leaves smooth. 3. *Verba'scum Tha'psus, Great Mullen;* leaves stellate, hairy, mucilaginous. 4. *I'nula (Cony'za) squarro'sa, Spikenard;* leaves nearly entire, obscurely reticulate, upper side rough. 5. *Sy'mphytum officina'le, Common Comfrey*, and *I'nula Hele'nium, Elecampane;* leaves of both slightly resemble the official.

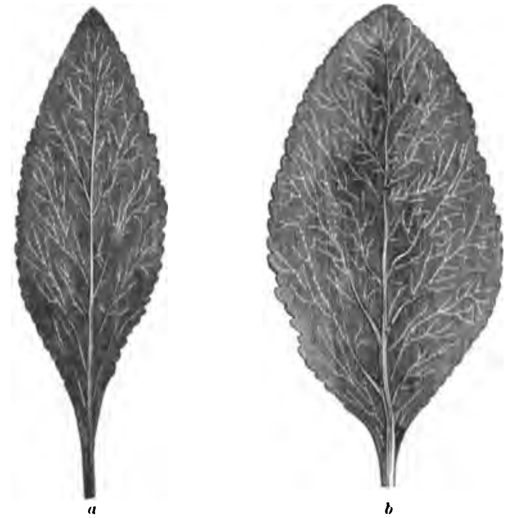
Commercial.—The leaves lose on drying 75 p. c. in weight, and should be collected from wild plants growing in mountainous regions when two-thirds of the flowers are expanded; this latter is essential from the fact that there are two series of compounds formed by the action of light and air in plants, first, *nutritious*, those for nutrition (constructive metabolism), second, *secretious*, or secretions of waste products (destructive metabolism). During the flowering stage every nutritive avenue and substance are taxed and used for flower perfection, thus leaving elsewhere, as in leaves, etc., the waste products, alkaloids, etc., in a most concentrated form; for the same reason belladonna, hyoscyamus and many other plants should have leaves gathered only when in bloom, which for digitalis, hyoscyamus and belladonna is the second year of growth, hence the second crop of leaves. Only those full grown and fresh are gathered, then carefully dried by sun or fire, each being separate, or in baskets placed in dark drying stoves; by lack of care in drying they often become inert. When dry should be kept in tightly-closed tin cans, or powdered and preserved in well-stoppered bottles. Should not be kept over one year, their quality being recognized by color, smell and taste. Seeds are much stronger, keep better, and do not deteriorate upon drying.

FIG. 344.



Digitalis purpurea; *a*, single flower; *b*, the same opened.

FIG. 345.



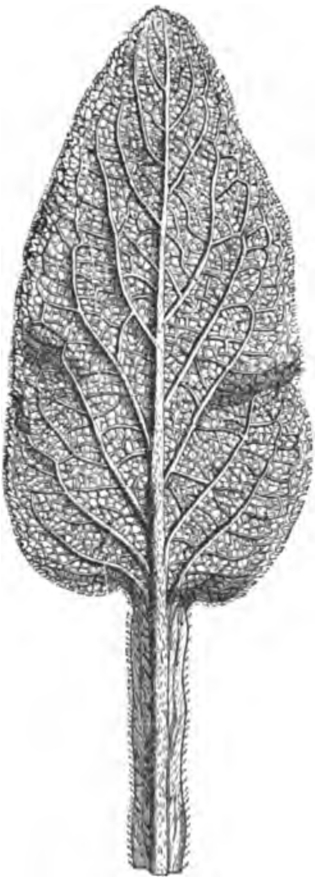
Digitalis leaves, upper surface; *a*, of the first year's growth; *b*, of the second year's growth.

CONSTITUENTS.—Digitalin, digitoflavon, resin, digitalosmin (stearopten), digitoleic acid, extractive, mucilage, inosit, pectin, ash 10 p. c.

Digitalin (Digitalinum).—A glucoside extracted by digesting leaves 1 part in alcohol 3, at 49° C. (120° F.) for twenty-four hours;

percolate with alcohol until exhausted, reclaim alcohol, mix residue with acidified (acetic acid) water and charcoal, digest, filter, dilute filtrate, neutralize with ammonia, precipitate with tannin, wash precipitate, rub down with alcohol and lead oxide, boil with alcohol an hour, add charcoal, filter, evaporate, wash residue with ether. It is a yellowish powder, or scales, soluble in alcohol, insoluble in water, and thus constitutes the French. Our commercial digitalin is the German, and beyond being largely soluble in water, is possibly a mixture of six compounds: 1. *Digitalin*, $C_{35}H_{56}O_{14}$, crystalline, soluble in alcohol, insoluble in water, alcoholic solution heated with diluted hydrochloric acid yields digitaligenin, glucose, digitalose. 2. *Digitoxin*, $C_{34}H_{54}O_{11}$, crystalline, most active principle, heart stimulant, soluble in alcohol, ether, chloroform, insoluble in water, deposited as a sediment from alcoholic preparations of leaves, by acids converted into digitoxigenin, digitoxose. 3. *Digitophyllin*, $C_{32}H_{52}O_{10}$, glucoside, heart stimulant, hydrolized with difficulty, not very soluble, otherwise resembles digitoxin. 4. *Digitonin*, $C_{27}H_{48}O_{14}$, the preponderating and diuretic principle, glucoside, white powder resembling saponin, soluble in water, solution foaming, crystallizes from alcohol; red with sulphuric or warm hydrochloric acid, splitting into dextrose, galactose, digitogenin. 5. *Digitalein*, glucoside, soluble in alcohol, ether, water; existence doubted by some. 6. *Digitin*, thought by some to be digitonin, possibly inert.

FIG. 346.



Digitalis leaf ; under surface.

Owing to varying composition of digitalin uniform doses become impossible; usual dose, gr. $\frac{1}{60}$–$\frac{1}{30}$ (.001–.002 Gm.); if in crystals it consists largely of digitoxin and digitonin. Dose, gr. $\frac{1}{200}$–$\frac{1}{100}$ (.0003–.0006 Gm.).

Digitoflavon, $C_{15}H_{10}O_6$.—This comes out with the digitoxin, when the extract is shaken with ether. It is not a glucoside, but a phenol (quercetin series), and occurs in yellow crystals, soluble in alcohol.

PREPARATIONS.—1. *Extractum Digitalis*. Extract of Digitalis. (Syn., Extractum Digitalis Alcoholicum; Fr. Extrait Alcoolique de Digitale; Ger. Fingerhut-Extrakt.)

Manufacture: Macerate, percolate 100 Gm., with alcohol 65 p. c., q. s. Dose, gr. $\frac{1}{6}$–$\frac{1}{2}$ (.01–.03 Gm.).

2. *Extractum Digitalis Fluidum.* Fluid Extract of Digitalis. (Syn., Fr. Extrait liquide de Digitale ; Ger. Flüssiges Fingerhut-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏j–2 (.06–.13 Cc.).

3. *Infusum Digitalis.* Infusion of Digitalis. (Syn., Fr. Tisane de Digitale ; Ger. Fingerhutaufguss.)

Manufacture: 1.5 p. c. Macerate 1.5 Gm. with boiling water 50 Cc., cool, strain, add alcohol 10, cinnamon water 15, cold water q. s. 100 Cc. Dose, ℥ss–1 (15–30 Cc.).

4. *Tinctura Digitalis.* Tincture of Digitalis. (Syn., Fr. Teinture de Digitale ; Ger. Fingerhuttinktur.)

Manufacture: 15 p. c. Macerate, percolate 15 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

Unoff. Prep.: Abstract. Dose, gr. ¼–1 (.016–.06 Gm.).

While the infusion is the best diuretic, the tincture is the best for heart action. This latter and the fluid extract, owing to alcohol present, contain most digitalin and digitalein, with very little digitonin —the digitoxin being precipitated. The extract has also digitoxin, while infusion mostly digitonin, little digitalein, no digitoxin or digitalin.

PROPERTIES.—Cardiac tonic, vascular stimulant, diuretic, motor-excitant, paralyzant, anaphrodisiac, sedative, narcotic, emetic ; normal doses make the pulse slower, firmer, stronger. The diastole (periodic dilatation) is prolonged, owing to stimulation of the pneumogastric ; the systole (periodic contraction) is not altered as to duration, but is in degree, the force being greatly increased, owing to stimulation of the heart muscle and its contained ganglia, which may be so powerful as to squeeze out all of the blood, thus causing death in systole by over-stimulation. Temperature is lowered by the lessening of blood supply to the tissues. Blood-pressure in the glomeruli of the kidneys is increased, causing diuresis. Recumbent position is best when under its influence. Large doses cause sneezing, nausea, vomiting, dark-green bile, colic, purging, headache, rapid, irregular pulse, vertigo, yellow vision, paralysis of cardiac muscle, coma, convulsions, death. The rapid pulse is due to over-stimulation of the pneumogastric (inhibition) and consequent exhaustion, thus allowing the sympathetic alone to control the action. Digitalis and aconite slow the heart, otherwise are antagonistic ; the former increases inhibition, stimulates motor apparatus ; the latter does the converse, thus weakening the beat, both finally paralyze cardiac ganglia ; digitalis by over-stimulation ; aconite by direct depression. Arterial tension is raised by digitalis, lowered by aconite ; this latter acts quickly, the former slowly, possessing cumulative action ; *i. e.*, several doses given at proper intervals may show no result until suddenly the combined action of all doses is manifested at once, proving sometimes fatal if not very cautious. In consequence of this, aconite becomes a more valuable antagonist in digitalis poisoning than digitalis in aconite poisoning.

Uses.—Where heart is rapid and feeble, renal disease, venous engorgement, dropsy, pneumonia, scarlet fever, congestive headache, hemicrania in mania, delirium tremens, hemorrhages, menorrhagia, rheumatic fever, spermatorrhœa, pleurisy, pericarditis, chronic bronchitis, epilepsy. Locally to enlarged glands, abdominal and renal dropsy.

Poisoning: Wash stomach out with warm water and tannin, give diffusible stimulants (injections), aconitine (best to large quantities), opium (best to long usage), saponin, senegin (best physiological antagonist), external heat, horizontal position.

Incompatibles: Cinchona, tannin, iron sulphate, lead acetate, tincture of ferric chloride, syrupy and watery solutions, which may decompose drug's active principles.

Synergists: Cardiac stimulants, belladonna, ergot, etc.

Allied Plants:

1. *Verba'scum Tha'psus, Mullen.*—Europe, but naturalized in N. America. Flowers and leaves used. Plant .3–1.3 M. (1–4°) high, woolly, growing in fields, waste places; flowers yellow, 2.5–4 Cm. (1–1½′) broad; odor honey-like; taste mucilaginous, sweet. Contains volatile oil, mucilage, sugar. Used as demulcent, pectoral, anodyne, nutritive for consumption, coughs; in infusion. Dose, gr. 15–60 (1–4 Gm.). Dried leaves smoked for nasal catarrh.

78. PEDALIACEÆ. Pedalium Family.

Pe-da-li-a'se-e. L. *Pedali-um(on)* + aceæ, fr. Gr. *πηδάλιον*, a rudder; *i. e.*, named in allusion to the dilated angles of the fruit. Herbs. Distinguished by being glandular, having oily seeds; leaves entire, exstipulate; flowers large, irregular, calyx 5-cleft, corolla bilabiate, stamens didynamous, anthers 2-celled; ovary on fleshy disk, 1-celled, sometimes 4–6-celled, style 1, stigma divided; fruit drupe or capsule; seeds wingless, exalbuminous; tropics; demulcent.

Genus: 1. **Sesamum.**

SESAMUM. BENNE.

Oleum Sesami. Oil of Sesamum. Teel Oil. Benne Oil, *official.*

Sesamum indicum, *Linné.* } A fixed oil, expressed from the seed.

Habitat. India (Africa, Egypt, Cyprus, Sicily, Turkey, Persia, China, Formosa, Java). Cultivated in N. and S. America, S. United States, W. Indies.

Syn. Oily Grain, Oil Plant, Til Seed, Teel, Sesame Oil, Gingili Oil. Fr. Huile de Sésame. Ger. Sesamöl.

Ses'a-mum. L.—Gr. *σησάμον*, fr. Egypt. *sempsen*; *i. e.*, the original plant name.
In'di-cum. L. *indicus*, Gr. Ἰνδικός, Indian, pertaining to or growing in India.

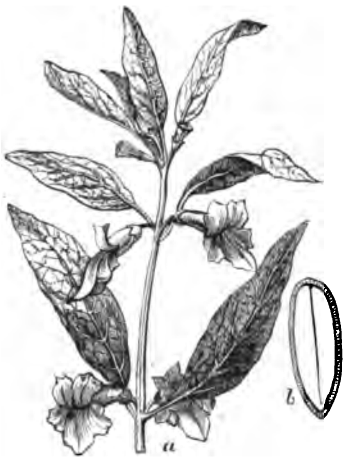
Plant.—Annual herb; stem 1–1.3 M. (3–4°) high, branched, quadrangular, striate, somewhat hairy, leaves lanceolate-ovate, lower ones 3-lobed, upper undivided, serrate, slightly pubescent, prominent veins beneath, petiolate; flowers tubular, campanulate, 4 Cm. (1½′) long, pale-purple; fruit, capsule 2.5–5 Cm. (1–2′) long, narrowly oblong, quadrangular-compressed, rounded angles, pointed, falsely 4-celled, pericarp leathery, olive-green; yellowish inside, densely hairy, splits loculicidally from above into 2 valves; seeds 5 Mm. (1/5′) long, rounded, triangular, flattened, testa smooth, thick, variegated color, mostly yellow.

CONSTITUENTS.—Fixed oil 50–56 p. c., proteids 22 p. c., mucilage 4 p. c., ash 4.8 p. c.

Oleum Sesami. Oil of Sesamum.—A yellowish, non-drying oily liquid, inodorous, bland nut-like taste, sp. gr. 0.920; thickens at – 3° C. (26.6° F.), congeals at – 5° C. (23° F.) into yellowish-white mass. Contains olein 76 p. c., myristin, palmitin, stearin, resinoid compound, higher alcohol, $C_{25}H_{44}O$, sesamin, $C_{11}H_{12}O_3$ (crystalline), and uncrystallizable oil (thick, non-nitrogenous, causing the oil to give cherry-red with hydrochloric acid and sugar). *Tests:* 1. With hydrochloric acid emerald-green; with sulphuric acid converted into brownish-red jelly. 2. Oil agitated with solution of pyrogallol in hydrochloric acid, then heated to boiling gives deep-purple color (abs. olive, almond and other oils). 3. Its solid portion upon saponification yields palmitic, stearic and myristic acids. Should be kept in well-stoppered bottles. Dose, ℥ss–2 (15–60 Cc.).

Commercial.—Plant has been long cultivated in Asia, Africa, by Persians, Arabs, Egyptians, and from this latter country supposed to have reached the United States in African slave traffic. The seeds are used natively for food (parched) in broths, puddings, bread, etc. The oil is usually expressed, but can be extracted by carbon disulphide.

FIG. 347.



Sesamum indicum; *a*, flowering branch; *b*, section of seed enlarged.

PROPERTIES.—Laxative, demulcent, emollient, nutritious.

USES.—Like olive oil, only less agreeable and digestible. Mostly as external medicine, in hair preparations, as a substitute for olive oil in preparations; internally in emulsion.

Leaves official, 1830–1880, abound in gum or mucilage, which is extracted by soaking in cold water, thus yielding rich, bland, mucilaginous, demulcent drink, applicable for diarrhœa, dysentery, cholera infantum, catarrh, acute cystitis, strangury, etc. The seeds are often used by the Southern negroes, as by the natives, for food, and beaten up for poultice; infusion as emmenagogue, abortive.

Allied Oils:

1. *Ground-nut Oil, Pea-nut Oil,* (*A'rachis hypogæ'a*).—Tropic America. Seeds contain fixed oil 45 p. c. Used instead of olive oil.

2. *Soy Oil,* (*Gly'cine* (*So'ja*) *hi'spida*).—Japan. Seeds reniform,

used as food and for making a sauce (soy); contain bland fixed oil 15–20 p. c.

3. *Ben Oil*, *Behen Oil*, (*Mori'nga pterygospe'rma*).—E. India. Seeds called *ben-nuts*, have elongated, membranous wings; yield fixed oil 30 p. c., used as purgative and in extracting perfume from flowers.

79. RUBIACEÆ. Madder Family.

Ru-bi-a'se-e. L. *Rubi-a*+aceæ, madder, fr. *rubeus*, *rubere*, red; *i. e.*, referring to color of the roots. Trees, shrubs, herbs. Distinguished by versatility of important uses; stems round or angular; leaves opposite, stipulate, calyx 4–5-toothed, superior; corolla 4–5, regular, epigynous; stamens 4–5, on corolla-tube, anthers 2-celled; ovary inferior, 2–4-celled; fruit inferior, dry or succulent, edible, 2-celled; seeds 1 or more in each cell; temperate climates, tropics; tonic, febrifuge, astringent, emetic, purgative, diuretic, emmenagogue, dyeing, tanning, poisonous.

Genera: 1. **Coffea.** 2. **Uragoga (Cephaëlis).** 3. **Cinchona.**

CAFFEA. COFFEE.

Caffeina. Caffeine (Theine), $C_8H_{10}N_4O_2 + H_2O$, *official*.

Coffea arabica, *Linné,*
and
Thea sinensis, *Linné.*

A feeble basic proximate principle (alkaloid) from the dried seeds of the former and dried leaves of the latter (Theaceæ), also from other plants. See p. 387.

Habitat. No. 1. Tropical Africa (Arabia, Abyssinia, Ceylon, Mocha). Cultivated in tropical countries (Java, W. Indies, S. America—Brazil, etc.). No. 2. S. E. Asia (upper Assam, China, Japan, Java, S. United States); cultivated.

Syn. Semen Coffea. Fr. Café. Ger. Kaffee, Caffeia, Guaranine. Fr. Caféine, Théine. Ger. Koffeïn, Kaffeïn, Theïn.

Cof'fe-a. L. for coffee, after Coffee, a province of Narea, in Africa, where it grows abundantly; Arabic name of the decoction—*chaubé*, *cavé*, *cahua*, *caova*.

A-rab'i-ca. L. Arabian; *i. e.*, its chief habitat.

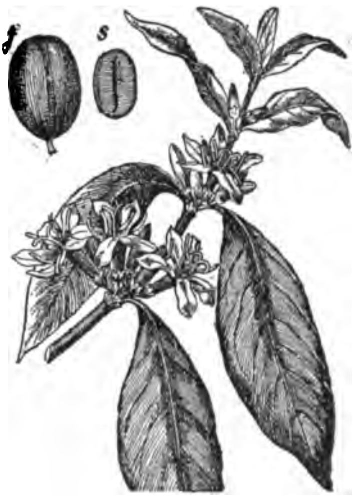
Plant.—Shrub or small tree 3–4.5 M. (10–15°) high, by cultivation trimmed down to 1.5–2 M. (5–6°); bark smooth, gray; leaves 10–15 Cm. (4–6') long, 2.5–5 Cm. (1–2') wide, oval, entire; flowers small, fragrant, white, funnel-shaped, cymes; fruit oblong, ovoid, 12 Mm. (½') long, scarlet, but purple when ripe, 2-celled, 2-seeded, pericarp with scanty pulp, endocarp thin, dry; seeds large, solitary in each cell, rounded back, flat on ventral surface (by which they face each other), having in the centre a deep narrow fissure, hard, bony, grayish.

Adulterations.—Inferior grades—natural discolored—yellow and brown grain—artificial colored with Prussian blue, indigo (removed by soaking in water), factitious coffee made up of clay, kaolin, evaporated skimmed milk, etc., these have little taste and no groove on flat side. Ground coffee, sometimes mixed with roasted dandelion, chicory, amylaceous roots, corn, peas, beans, wheat, rye, sweet potatoes, coffee extract, etc.

CONSTITUENTS.—Caffeine 1–1.3 p. c., fat 13 p. c., glucose, dextrin 15 p. c., proteids 13 p. c., caffeo-tannic acid, volatile oil, ash 3–5 p. c.

Caffeina. Caffeine (Theine).—(Syn., Guaranine, Methyltheobromine, Trimethylxanthine.) It can be obtained from infusion of coffee or tea by adding lead acetate solution to precipitate the tannin and coloring matter, filtering and adding hydrogen sulphide to decompose excess of lead acetate, concentrating filtrate, neutralizing with ammonia, and upon cooling caffeine deposits in crystals. It occurs in white silky needle crystals, odorless, bitter taste, soluble in 80 parts water, 33 alcohol, 7 chloroform, completely volatile; boiling with barium or potassium hydrates converts it into CO_2 and caffeidine, $C_7H_{12}N_4O$, this latter going into sarkosine, formic acid, methylamine and ammonia; forms numerous salts (citrate, nitrate, phosphate, etc.). *Tests:* 1. Sulphuric acid solution + fragment of potassium dichromate gives yellowish then green liquid. 2. Aqueous solution should not be precipitated by mercuric potassium iodide T. S. (abs. of other alkaloids). Dose, gr. 1–5 (.06–.3 Gm.).

FIG. 348.



Coffea arabica.

Commercial.—Coffee tree resembles our cherry, grows in clusters in hilly woods, 300–600 M. (1,000–2,000°) elevation. Was first known in Europe (1652) as being from Arabia and Abyssinia, where it was popular in the fifteenth century. The Dutch first grew it in Europe, 1690, and introduced it into America at Surinam, 1718, Cayenne, W. Indies, 1725. Have several varieties: 1. *Mocha.* Best and smallest, growing on the Arabian hills around Mocha, dark-yellow. 2. *Java, E. Indian, Ceylon.* Largest grained, pale-yellow. 3. *Rio, Brazilian, W. Indian, Demerara.* Intermediate size, bluish or greenish-gray. 4. *Liberian (C. libe'rica).* Has larger berries, finer flavor. The seeds are separated from papery endocarp by drying, peeling, and winnowing mill. In roasting, the fat, sugar, and tannin are destroyed, some caffeine lost, and empyreumatic volatile oil (caffeone) or some other active principle, volatile or otherwise, is produced—losing 8 p. c. water and 9 p. c. organic matter. Much care should be exercised in this process not to use too great heat.

PREPARATIONS.—1. *Caffeina Citrata.* Citrated Caffeine. (Syn., Br. Caffeinæ Citras; Fr. Citrate de Caféine; Ger. Koffeïn-Citrat.)

Manufacture: Dissolve citric acid 50 Gm. in hot distilled water, 100 Cc., add caffeine 50 Gm., evaporate until dry. It is a white powder, forming syrupy clear solution in 3 parts of water, which precipitates caffeine upon further dilution until 25 parts, when it redissolves; it is also soluble in a mixture of chloroform 2 volumes + water 1. Dose, gr. 2–10 (.13–.6 Gm.).

2. *Caffeina Citrata Effervescens.* Effervescent Citrated Caffeine.

Manufacture: Caffeine 1 Gm., citric acid 1, sodium bicarbonate 33, tartaric acid 30, sugar 35, alcohol q. s. 100 Gm. Mix solids, then make them into a paste with alcohol and pass through a tin colander, dry, granulate. Dose, ʒj–2 (4–8 Gm.).

PROPERTIES.—Tonic, stimulant, nervine, antiemetic; caffeine in small doses stimulates appetite, digestion, secretion of bile, quickens heart action, respiration, increases arterial tension, urine; normal doses, cerebral stimulant, causing nervous restlessness, wakefulness, increased mental activity. Large doses (gr. 5–10; .3–.6 Gm.) produce heaviness of head, insomnia, delirium, rapid, feeble pulse, cold extremities, elevated temperature, convulsions, paralyzes cardiac muscle, but death from paralysis of respiration. It is a valuable hydragogue diuretic. Coffee is laxative, diuretic, antiperiodic, antiseptic. Used mostly, however, as a beverage, for which purpose alone about one billion five hundred million pounds are consumed annually, making one pound to every living person; in the United States about 6–7 lbs. (2.7–3 Kg.) per capita, in Holland 10 lbs. (4.6 Kg.).

USES.—Caffeine in neuralgia or nervous headaches, diarrhœa of cholera, phthisis, cardiac and renal dropsies, lithæmia, gout, insomnia of chronic alcoholism, adynamic fevers. Coffee in intermittents, asthma paroxysms, opium narcosis, to antagonize increased torpor of nervous centres.

Allied Plants:

1. In addition to the official source, *C. arabica,* there are a number of species that furnish coffee, as *C. mauritia'na,* of Mauritus, *C. zanguebа'ria,* of Zanzibar, Mozambique, etc., and *C. libe'rica,* of Liberia, this last being by far the most important of the three.

2. *Cola acuminata, Cola Nut.*—Sterculiaceæ. W. Africa (see page 387). Seeds contain caffeine 2 p. c., theobromine, tannin, volatile oil, etc.

3. *Paullinia Cupana, Guarana.*—Sapindaceæ. Brazil (see page 371). Seeds contain caffeine (guaranine) 4–5 p. c., tannin 2.6 p. c., starch, mucilage, fat, saponin, resin, volatile oil.

IPECACUANHA. IPECAC.

Uragoga Ipecacuanha, (*Brotero*) *Baillon.*
(Cephaëlis Ipecacuanha, (*Brotero*) *A. Richard.*) } The root.

Habitat. Brazil to Bolivia, Colombia in damp forests. Cultivated in India.

Syn. Radix Ipecacuanhæ. Fr. Racine brésilienne, Ipécacuanha, Ipécacuanha annele (officinale). Ger. Brechwurzel, Ruhrwurzel.

U-ra-go'ga. L. fr. Gr. *οὐρός*, serum, etc., + *αγωγή*, *αγωγός*, leading off, carrying away; *i. e.*, empties the stomach of its contents, serum, etc.

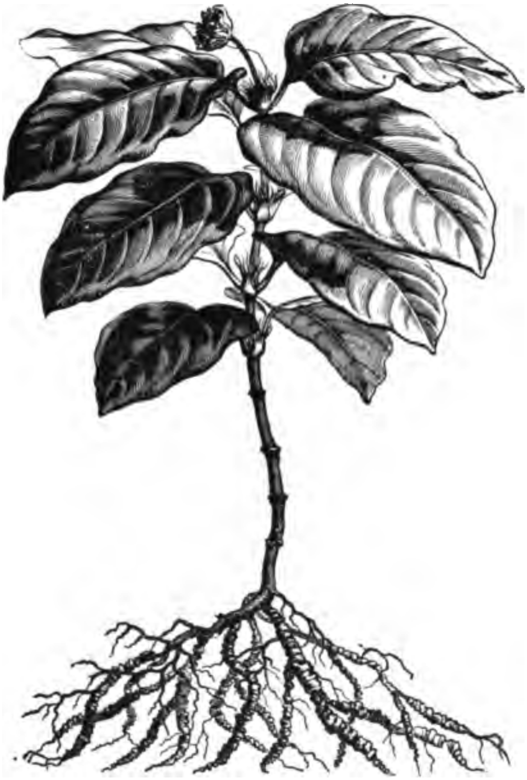
Ip-e-cac-u-an'ha. L. fr. Braz., Indian name *ipecaaguen*, which means "smaller roadside sick-making plant."

Ceph-aë'lis. L. fr. Gr. *κεφαλή*, a head, + *εἰλω*, to collect; *i. e.*, flowers collected into a capitulum.

Ip'e-cac. An abbreviation of ipecacuanha.

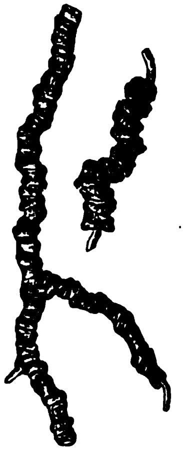
Plant.—Shrubby perennial; stem .3–.5 M. (12–18′) high, with often .3 M. (12′) additional underground, decumbent or erect, woody, knotted with leaf-scars, smooth and gray at the base, quadrangular, pubescent and green above, simple or branched; leaves few, 6–8, somewhat crowded at the top, 7.5–10 Cm. (3–4′) long, 2.5–5 Cm. (1–2′) broad, stipulate, opposite, petiolate, obovate, entire, wavy margins, dark-green, smooth above, paler, pubescent, prominent veined beneath; flowers Jan.–Feb., small, white, dense heads, 8–20 together, funnel-shaped, hairy; fruit May, in clusters of dark-purple berries 12 Mm. (½′) long, each with 2 small, plano-convex, stony seeds. **Root**, 10 Cm. (4′) long, 4 Mm. (⅙′) thick, simple or branched, contorted, grayish-brown, or blackish, finely wrinkled, closely and irregularly annulated, often transversely fissured, bark thick, brittle, brownish, easily separated from the thin, whitish, tough, ligneous portion; odor slight, peculiar, nauseous; taste bitterish, acrid, nauseating. Sound ipecac in quality is proportionate to the thickness of the bark (80 p. c.) and the thinness of the wood (20 p. c.), as most of the alkaloids reside in the former. *Solvents:* alcohol; water (injured by boil-

Fig. 349.



Uragoga (Cephaëlis) Ipecacuanha.

Fig. 350.



Ipecac root; normal size.

ing). Dose, emetic, gr. 20 (1.3 Gm.) or gr. 5–10 (.3–.6 Gm.) repeated in ten-minute intervals, each being followed by hot chamomile tea; nauseant, diaphoretic, expectorant, gr. 1–2 (.06–.13 Gm.).

ADULTERATIONS.—With roots of allied species, and portions of non-annulated woody stem, also roots of *Trio'steum perfolia'tum.* The powder is very easily adulterated with starches, flour, almond-meal, etc., all of which can be readily recognized under microscope—the two former by their shaped granules, the latter having scurvy testa, oil-cells, and yielding hydrocyanic acid when infused with water.

Commercial.—Ipecac was first known in Europe, 1672, as about this time Helvetius, a Dutch physician, became celebrated in Paris from its use as a secret; it was, however, in 1688, purchased from him by Louis XIV. for 1,000 louis d'or (= $4,600). It grows in hot, moist forests, under trees in bunches, presenting two varieties according to its woody or herbaceous stems, otherwise exactly alike. The color of the roots of either kind is not uniform, both furnishing *brown, red,* and *gray,* which difference is only superficial, depending solely upon season of year collected, age, soil, climate and mode of curing; the brown is least bitter and most abundant with us; the gray is most bitter and the larger. The root is collected any time (mainly Jan.–March), except in rainy weather, as then cannot dry properly, by Poayeros (collectors, fr. Braz. name of the plant, *Poaya*), who catch the stem, pull it backward as far as possible, and thrust deep into the ground a stick with broad, sharp end, thus cutting the ramifications, but leaving enough roots to produce, from adventitious buds, new plants the following year. Roots are cleaned of adhering earth by shaking, put into bags, at night sorted, next day spread in the sun and carefully dried for 3–4 days, being protected at night from heavy dews. When dry it is broken into small pieces, separated from earthy particles by sieves, and packed into bags or bales—mainly exported from Brazil as *Rio ipecac,* and sparingly from Colombia as *Carthagena ipecac,* this latter being a larger root, less annulated, and of a different botanic source.

CONSTITUENTS.—Alkaloids 2.10–2.65 p. c.: Emetine 1.45 p. c., Cephaëline 0.6 p. c., Ipecacuanhic acid, choline, resin, pectin, starch, saccharose.

Emetine, $C_{30}H_{42}N_2O_4$.—Obtained by adding basic lead acetate to alcoholic tincture until it ceases to precipitate, evaporating filtered liquid to dryness; dissolve residue in weak acid, and mix clear solution with ether, add ammonia in excess, shake. The ether solution of alkaloid is shaken out with weak sulphuric acid and the base precipitated from the aqueous solution by soda in excess, wash, dry. The retained base is removed by dissolving in acid and shaking with soda in presence of ether, this being repeated until the base, soluble in caustic alkali, has been completely separated. The insoluble base is converted into hydrochloride, recrystallized from water and the base finally precipitated with ammonia. The alkaline solution acidulated, then shaken with ether and ammonia, gives the base soluble in caustic alkali—cephaëline. Emetine is amorphous, white, becoming yellow by exposure, soluble in alcohol, ether, benzene, chloroform; forms salts, most of which are crystalline. Dose, expectorant gr. $\frac{1}{120}$ – $\frac{1}{60}$ (.0005–.001 Gm.); emetic gr. $\frac{1}{16}$ – $\frac{1}{4}$ (.004–.016 Gm.). Poisonous in large quantities; impure emetine is ten times weaker.

Cephaeline, $C_{28}H_{38}N_2O_4$.—This is crystalline, white, becoming yellow by exposure, distinguished from emetine by its solubility in caustic alkalies and being less soluble in ether; forms uncrystallizable salts. Dose, same as emetine.

Ipecacuanhic Acid (Cephaëlic Acid), $C_{14}H_{18}O_7$.—An amorphous, bitter glucoside, once thought identical with gallic acid, but is nearer caffeo-tannic acid; obtained by precipitating decoction with lead acetate, dissolving precipitate in acetic acid, then precipitating with lead subacetate; it is bitter, amorphous, brown, soluble in alcohol, green with ferric salts.

PREPARATIONS.—1. *Extractum Ipecacuanhæ Fluidum.* Fluid Extract of Ipecac. (Syn., Fr. Extrait liquide d'Ipécacuanha; Ger. Flüssiges Ipecacuanha-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏j–20 (.06–1.3 Cc.).

Preps.: 1. *Syrupus Ipecacuanhæ.* Syrup of Ipecac. (Syn., Fr. Sirop d'Ipécacuanha; Ger. Ipecacuanhasirup.)

Manufacture: Mix fluid extract of ipecac 7 Cc., water 30, acetic acid 1, add to filtrate water q. s. 50, to which add glycerin 10, sugar 70 Gm., water q. s. 100 Cc. Dose, ʒss–4 (2–15 Cc.).

2. *Tinctura Ipecacuanhæ et Opii.* Tincture of Ipecac and Opium.

Manufacture: Evaporate tincture of deodorized opium 100 Cc. to 80 Gm., cool, add fluid extract of ipecac 10 Cc., filter, add diluted alcohol q. s. 100 Cc. Dose, ♏v–20 (.3–1.2 Cc.).

3. *Vinum Ipecacuanhæ.* Wine of Ipecac. (Syn., Fr. Vin d'Ipécacuanha; Ger. Brechwurzelwein.)

Manufacture: Mix fluid extract of ipecac 10 Cc., alcohol 10, white wine 80. Dose, ♏j–60 (.06–4 Cc.).

2. *Pulvis Ipecacuanhæ et Opii.* Powder of Ipecac and Opium. (Syn., Dover's Powder; Br. Pulvis Ipecacuanhæ Compositus; Fr. Poudre de Dower; Ger. Pulvis Ipecacuanhæ Opiatus, Pulvis Doweri, Dower'sches Pulver.)

Manufacture: 10 p. c. Mix ipecac 10 Gm., powdered opium 10, sugar of milk 80. Dose, gr. 5–10 (.3–.6 Gm.).

3. *Trochisci Ipecacuanhæ.* Troches of Ipecac. (Syn., Ipecacuanha Lozenges; Fr. Tablettes (Pastilles) d'Ipécacuanha, Tabellæ cum Ipecacuanha; Ger. Brechwurzel-pastillen.)

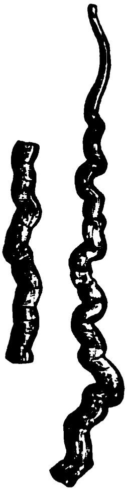
Manufacture: Mix ipecac 2 Gm., tragacanth 2, sugar 65, syrup of orange q. s. 100 troches. Dose, 1–2 troches occasionally.

4. *Trochisci Morphinæ et Ipecacuanhæ.* Gr. $\frac{1}{13}$ (.005 Gm.; morphine sulphate gr. $\frac{1}{40}$; .0016 Gm.) in each troche. Dose, 1–3 troches, with caution.

Unoff. Preps.: Extract. Dose, gr. $\frac{1}{20}$–$\frac{1}{2}$ (.003–.03 Gm.). *Infusion,* 5 p. c. Dose, ℥ss–1 (15–30 Cc.). *Decoction.* Dose, ℥ss–1 (15–30 Cc.).

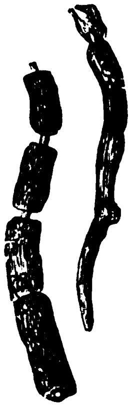
PROPERTIES.—Emetic, nauseant, expectorant, diaphoretic, sternutatory (cholagogue, antiseptic, hæmostatic, counter-irritant). Small doses (gr. ⅛–¼; .008–.016 Gm.), stomachic, tonic, large doses (gr. 5–20; .3–1.3 Gm.), emetic in thirty minutes, not violent nor depressing; if doses repeated have tolerance, catharsis; may cause irritation, hemorrhage. Emetine kills animals by cardiac paralysis. Vomiting due to local irritation upon the stomach and a direct action upon vomiting centre in the medulla; it increases by stimulation, the secretion of bile, bronchial and intestinal mucus.

FIG. 351.



Undulated Ipecacuanha.

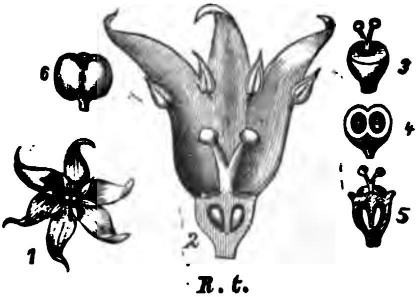
FIG. 352.



Striated Ipecacuanha.

USES.—Acute indigestion, bilious sick headache, small doses for bronchitis, whooping-cough, suffocating catarrh, spasmodic croup (here syrup given until vomiting occurs), spasmodic asthma, pneumonia, rigidity of os uteri, hæmoptysis, hemorrhage, atonic dyspepsia, vomiting in pregnancy (hourly ♏j; .06 Cc. of wine), catarrhal jaundice (gr. 20; 1.3 Gm. daily), chronic dysentery, diarrhœa, hectic sweats, cholera, cholera morbus, remittent fever, urticaria, cases of poisoning. Locally in ophthalmia (decoction). As diaphoretic and expectorant give at long intervals; the syrup always to infants. Its action is somewhat irregular, gr. 5 (.3 Gm.) doing sometimes the same as gr. 15 (1 Gm.). Emetine gr. $\frac{1}{10}$ (.006 Gm.) has vomited, while gr. 12 (.8 Gm.) given in twenty-four hours has caused no unpleasant symptoms.

FIG. 353.



Rubia tinctorum; 1, open flower; 2, longitudinal section of flower enlarged; 3, ovary; 4, cross-section of ovary; 5, longitudinal section of ovary; 6, fruit.

Poisoning: Unless thoroughly vomited, wash out stomach with tannin solution, if necessary follow with opium, belladonna, cardiac stimulants.

Incompatibles: Lead and mercury salts, vegetable acids, astringent infusions, bismuth, carbolic and hydrocyanic acids.

Synergists: Emetics, sedative expectorants, warm drinks.

Allied Plants:

1. *Urajoga (Cephaëlis) acumina'ta.*—Carthagena; root is larger, less annulate, bark more adherent, medullary rays more distinct.

2. *Psycho'tria eme'tica, Striated Ipecac.*—Root 6 Mm. ($\frac{1}{4}$') thick, longitudinally wrinkled, not annulate, transverse fissures through bark, purplish-brown; bark thick. Contains little emetine, much sugar, no starch. There is a small striated ipecac (a species of *Richa'rd(so'n)ia*) 3 Mm. ($\frac{1}{8}$') thick, otherwise same as the ordinary striated.

3. *Richa'rd(so'n)ia sca'bra, Undulated* or *Farinaceous Ipecac.*—Undulate wrinkled, annulate, transversely fissured, brownish-gray; bark white, mealy, not bitter, wood nearly as thick as the bark.

4. *Calceola'ria (Ioni'dium) Ipecacua'nha, White Ipecac.*—Violaceæ. Branched, not annulate, longitudinally wrinkled, whitish-yellow; wood porous, thick, yellowish, no starch.

5. *Ascle'pias curassa'vica, Bastard Ipecac.*—C. and S. America, has short rootstock abruptly divided into many yellowish rootlets.

6. *Ru'bia tincto'rum, Madder.*—The root official, 1820–1880. S. Europe, Asia. Perennial herb, square stem, covered with short prickles by which it climbs; leaves elliptical, 7.5 Cm. (3') long; flowers yellow; root creeping, 5 Mm. ($\frac{1}{5}$') thick, reddish, sweetish, bitter, acrid, astringent taste. Contains rubian (yellow), alizarin (orange-red), ruberythrin, (yellow needles, blood-red with alkalies), purpurin. Used as tonic, diuretic, emmenagogue in dropsy, amenorrhœa, rachitis, dyeing. Dose, gr. 15–60 (1–4 Gm.).

CINCHONA. CINCHONA.

Cinchona	**Calisaya** and hybrids, *Weddell*, **officinalis** and hybrids, *Linné*, **succirubra**, *Pavon*, and other species of Cinchona.	Containing at least 5 p. c. total alkaloids and 2.5 p. c. quinine. Containing not less than 5 p. c. total alkaloids.	The bark.

Habitat. S. America; cultivated in Java, India, Jamaica, Ceylon, W. Africa.

Syn. Yellow (Cinchona) Bark, Peruvian Bark, Jacket, Carthagena, Bicolorata, Huamielies, Loxa (Loja), Pale Crown, Silver Crown, Maracaibo, Pitaya, Red Carthagena, Bogota, Black Coquetta, White Crown, Lima, Huanuco, Red Cinchona or Saint Ann's Bark; Fr. Quinquina; Ger. Cortex Chinæ, Chinarinde, Peruvianische Rinde, China.

Cin-cho'na, better *Chinchona*, after Countess Ana de Osorio, wife of 4th Count of Chinchon, Sp. Viceroy of Peru (Chinchon, a town in Spain, near Madrid). She was cured in 1638 of tertian fever by this bark, through recommendation of a Jesuit; in 1640 she brought it to Europe, extolled its virtues, and thus published the hitherto Jesuit secret.

Cal-i-say'a. Name given the bark by Spaniards and Indians.

Of-fi-ci-na'lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

Suc-ci-ru'bra. L. *succus*, juice, + *ruber*, red; *i. e.*, sap first colorless then white, and red on exposure.

Quina (Gheena), Peru, Indian name for bark; *quina-quina* = medicinal bark; this name they also apply to other barks, and from it comes Fr. Quinquina; Ger. China, very similar to Sp. *cascarilla*, dim. of *cascara*.

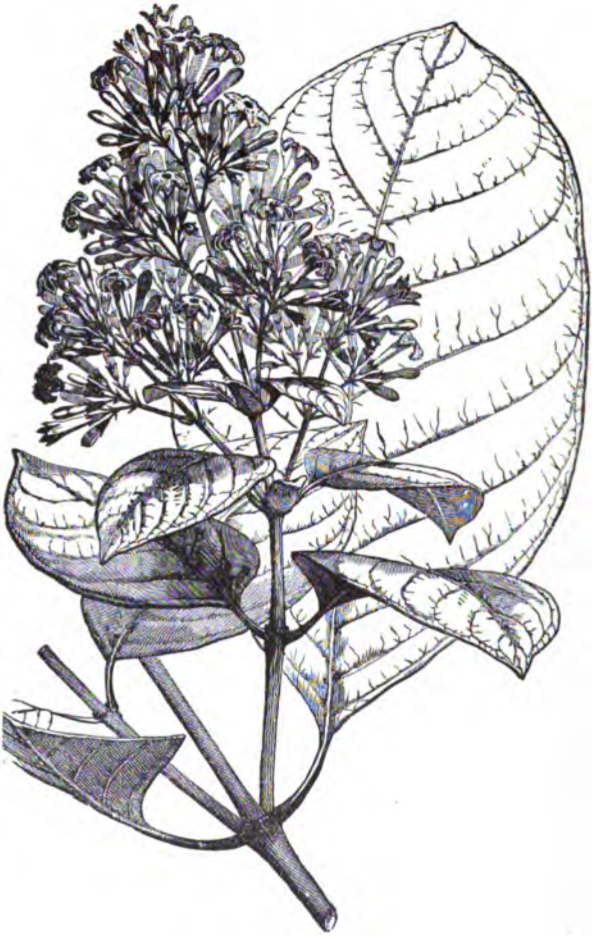
PLANTS.—Some thirty-six species have been recognized, but the three official varieties are the best producers, at the same time the following may be considered in order of importance.

1. *Yellow—Cinchona Calisaya*, and its var. *Ledgeria'na*.

2. *Pale Crown Loxa—Cinchona officina'lis,* var. (*a*) *Condami'nea,* (*b*) *Bonpla'ndia,* (*c*) *cri'spa.*
3. *Red—Cinchona succirubra.*
4. *Gray—Cinchona ni'tida, C. micra'ntha, C. peruvia'na.*
5. *Colombian—Cinchona pitaye'nsis, C. lancifo'lia, C. cordifo'lia.*

All are evergreen trees, 12–24 M. (40–80°) high, .3–.6 M. (1–2°) thick at base; leaves laurel-like, entire, varying shape, the best pitted or scrobiculate on underside (except *succirubra*), midrib prominent, petiole and lamina often purplish when young or old; flowers tubular, fragrant, rosy-white, purplish, 5-divided; fruit capsule, 2-celled, splitting from base upward, containing many flat and winged seeds.

FIG. 354.



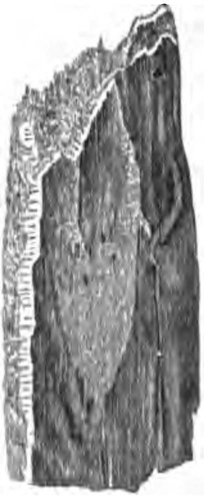
Cinchona succirubra.

BARK.—1. *C. Calisaya,* + var. *Ledgeriana,* in quills, curved pieces

3–6 Mm. ($\frac{1}{8}$–$\frac{1}{4}$′) thick, 10–30 Cm. (4–12′) long, grayish, wrinkled, transverse and longitudinally fissured, ridged, giving checkered appearance (chief characteristic, but absent from very young bark), sometimes warty, inner surface cinnamon-brown, finely striate, fracture short, granular in outer layer, finely fibrous in inner layer; bast-fibres single, rarely in twos, outside of which exists a zone of laticiferous ducts in young (inferior) samples; powder yellowish-brown; odor slightly aromatic; taste bitter, astringent. This is increasing in demand, is the richest in quinine, constituting 75 p. c. of its alkaloids.

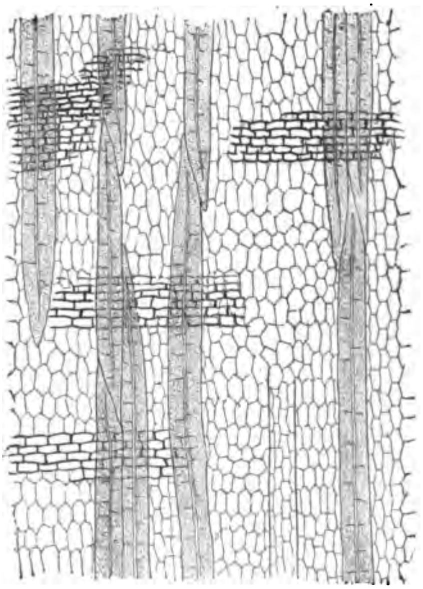
2. *C. officinalis.*—In single or double quills, covered more with lichens than any other—a sign of good quality; periderm darker than in the other species (grayish to blackish-brown), while inner surface is lighter (pale to reddish-brown), finely striate, fracture short, bast-fibres in threes, sixes, transversely fissured, powder pale-brown. By its prominent wide fissures, inconspicuous ridges and absence of longitudinal cracks it is distinguished from yellow and red bark, while it also has a characteristic odor and less bitter taste. This is on the decline, as quinine constitutes only 65 p. c. of total alkaloids.

FIG. 355.



Calisaya bark, showing digital furrow and short fibrous fracture.

FIG. 356.



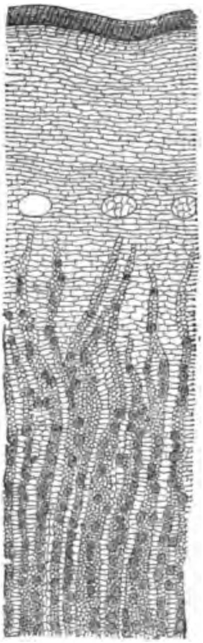
Calisaya bark; radial longitudinal section through liber, showing cinchona bast-fibres, bast-parenchyma, and medullary rays, magnified 60 diam.

3. *C. succirubra.*—In quills, like *C. Calisaya*, only broader, thicker, more warty, externally covered with grayish-brown cork, inside reddish-brown, chief characteristic is the pronounced longitudinal ridges, many being short and confluent, with intervening furrows, transverse fissures usually wanting, having no checkered appearance, fracture

short, splintery, not coarse, bast-fibres in twos, threes; powder reddish-brown; inodorous; taste bitter, astringent. This is on the decline, and while alkaloidal yield is great, only 20 p. c. is quinine. *Solvents:* acidified water or alcohol (65 p. c.). Dose, gr. 15–60 (1–4 Gm.).

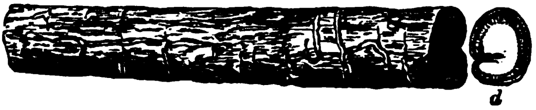
Commercial.—Cinchona plants natively always hug the mountains; in S. America, from 10° north latitude to 20° south latitude, on the eastern slope of central Andes chain, from Bolivia to Peru, Ecuador, also on east slope of western Cordilleras chain, thence to the highlands of Colombia, Venezuela, to Caracas and Caribbean Sea. The best flourish where mean annual temperature is 13° C. (55° F.), where the rainy season is nine months, in which rainfall is heavy at night and the days vary between sunshine and fog; for the other three months nights are frequently below freezing, days 24° C. (75° F.), with dense fogs. Less valuable species flourish where moisture is not so uniform and average temperature is 20° C. (68° F.). All locations must be well drained, hence no species flourish in valleys but on forest slopes, singly or few together, elevated 1,500–2,400 M. (5,000–8,000°); *C. barbacœ'ncis*—most worthless species, so low as 100 M. (330°); *C. succirubra* is valuable at 700 M. (2,300°); some do well at 3,500 M. (11,500°). Their area is limited to within 11 degrees to the north and south of Loja (Loxa), outside of which territory barks are almost worthless; the most southern being *C. austra'lis*, the most northern *C. tucuje'nsis* and *C. cordifolia*. The root-bark of all species is the richest.

FIG. 357.



Cinchona succirubra; transverse section of bark, magnified 30 diam.

FIG. 358.



Cinchona succirubra; natural quill; *d*, transverse section.

Cultivation.—Cinchona trees, growing natively in mountain forests along with bamboos, begonias, coca, fuchsias, orchids, palms, tree ferns, etc., are mostly unprotected and without owners, consequently often become common property and a prey to mercenary parties who have had little regard to future production. The demand was increasing, the supply decreasing, and it was only a question of time when the destruction would be complete, so naturally, this aroused the concern of medical and other scientific men. The natives guarded this indigenous inheritance with a careful eye, thus trying to prevent the visitation of foreigners and the possibility of it ever being transplanted. It was correctly surmised that the trees would flourish wherever climatic and other conditions were somewhat similar, so in 1737 La Condamine first attempted the experiment, but with failure; Dr. Weddell, 1846–47, sent seeds to France which only yielded ornamental plants; Mr. Hasskarl (Dutch), 1853, was the first to give practical results from the plants he collected and sent to Batavia, being aided by Junghuhn. Then followed Markham (English), 1859, Ledger, Spruce, Cross and others. Each of these gentlemen, in visiting, at various times, S. America, procured seeds, cuttings, etc., which were sent to India, Ceylon, Java, where now three-fourths of the bark is grown by cultivation. In fact, native bark is so poor in alkaloidal strength (2–4 p. c.) that it constitutes only about 5 p. c. (1 p. c. from wild, 4 p. c. from cultivated plants) of the sum-total bark annually used. And since all demand is for cultivated tree-bark, its commerce has been revolutionized in quantity, quality, and value. This genus hybridizes well, so that species and varieties have been formed yielding 5, 10, 15 p. c. total alkaloids, and those yielding only 3–4 p. c. are, in S. India and Java, uprooted by whole plantations and replaced by supposed richer hybrids. Propagation by cuttings is slow, so seeds are planted in nurseries, scions grafted and transplanted into orchards, which are cared for like cultivated fruit trees. When these are 6–15 years old the bark becomes more or less worthless, consequently they are cut down and replaced. The mountains most adapted for this cultivation are Neilgherry, Himalaya, and Blue.

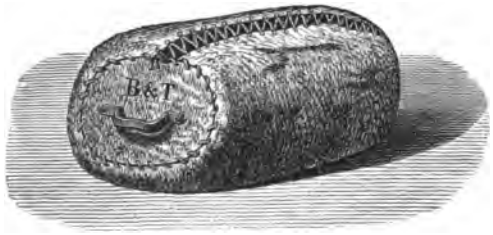
Collection. 1. *Wild S. American Bark.*—This was formerly collected by gangs of Cascarilleros, managed for companies by majordomos. These left the seacoast in dry weather on donkeys, for the distant mountains, being away several months. Arriving in the cinchona districts, they encamped near a stream, planted corn, beans, built huts, and depended upon game for meat. Having with a mallet loosened, then removed the trunk-bark, the tree was felled and entirely stripped of bark, which was carried to the huts and in the sun or under shelter allowed to dry in quills or in pieces pressed flat by rocks. When dried the best was put in canvas bundles (150 lbs.; 70 Kg.) and the return trip begun. At the coast ports these bundles were sewed up in fresh hides, forming, when dry, tight seroons, which were shipped as such, or in bales or boxes, from Guayaquil, Payta, Lima, Carthagena, Santa Marta, Buenos Ayres, etc. Bolivia is the only local country in which the trees are cultivated.

2. *Cultivated India Bark.*—This is cared for and collected in several ways: (*a*) *Uprooting.* This consists in pulling up and barking whole tree and replanting the ground, the bark of each tree-part being marketed separately. (*b*) *Coppicing.* Mostly practiced, and consists in felling trees, allowing shoots to spring from the stumps, and when these are eight years old collecting their bark. (*c*) *Shaving.* The outer bark of plants 3–5 years old is shaven off with drawing knives, leaving intact the liber, upon which another growth of richer bark soon forms. (*d*) *Mossing.* Alternating strips are taken off yearly, and the decorticated portion covered with moss, grass, straw, hay, rags, paper, etc.; this

gives an annual yield of rich bark during the tree's entire life. Bark is stronger in alkaloids which is thus covered, as it prevents the sun converting the alkaloids into coloring matter, especially on that side most exposed to direct rays (most quinine and quinidine in bark from trees grown in mid-woods (shade), most cinchonidine and cinchonine from trees exposed to sun). The two last methods not only furnish richest bark, but replace it rapidly, at the same time they have the drawback of being subject to the attack of stag beetles, ants, etc., in their new-forming bark-cells. Of the seventy-five million trees cultivated in the world, Java has thirty million, Ceylon twenty million, India fifteen million, C. America, Bolivia, Africa, each two million. All of this is in quills, whereas much of the wild-grown was in large pieces (*tabla*) thereby rendering examination easy.

CONSTITUENTS.—From 21–32 natural alkaloids; Quinine, Quinidine, Cinchonine, Cinchonidine, Quinamine, Chinoidine, (Conquinamine, Cupreine, Homoquinine, Hydroquinine, Paytine, Concusconine, etc.), 8 artificial alkaloids; Quinicine, Cinchonicine, Quinamicine, Apoquinamine, etc., Quinic acid, Quinovic acid, Cincho-tannic acid, Quinovin, Cinchona-red, volatile oil, gum, sugar, wax, ash 2–3 p. c.

FIG. 359.



Cinchona seroon.

The first four alkaloids are the most important, and can be obtained by mixing a concentrated infusion of cinchona with milk of lime, whereby this latter combines with the acids and coloring matter, thus liberating the alkaloids; now strain, and exhaust the residue with boiling alcohol, (benzin, kerosene), acidify with sulphuric acid, treat with animal charcoal, filter, and while hot neutralize with soda V. S., when quinine sulphate crystallizes out. To the mother-liquor add large excess of ammonia water, which precipitates cinchonine and cinchonidine, while quinidine remains in solution; dissolve the precipitate in boiling alcohol, and upon cooling cinchonine separates; by evaporating the two solutions we get on the one hand cinchonidine, and on the other quinidine. The respective salts can be prepared by dissolving the several alkaloids in water, adding sufficient of the desired acid for neutralization, then allowing to crystallize.

Quinina, Quinine, $C_{20}H_{24}N_2O_2 + 3H_2O$, *official.*—(Syn., Chininum; Fr. Quinine; Ger. Chinin.) This alkaloid, obtained from various cinchona species, occurs as a white, flaky powder, odorless, bitter, soluble in 6 parts alcohol, 1,670 water, 5 chloroform, 23 ether, benzene, dilute acids, ammonia, carbon disulphide, no residue on ignition. *Tests:* 1. Solution in sulphuric acid has blue fluorescence; by adding to this chlorine or bromine water + ammonia water in excess get emerald-green color if weak, a precipitate if concentrated. 2. With sulphuric acid get only faint-yellow (abs. organic impurities). 3. With nitric acid should not be red (abs. morphine). 4. 2 Gm. + 1 Gm. ammonium sulphate + 10 Cc. water, dry on water-bath, agitate residue with 20 Cc. water, shake occasionally for half hour; to filtrate add 7 Cc. ammonia water, when liquid should be clear (abs. other cinchona alkaloids). Should be kept dark in well-stoppered bottles. Dose, gr. 1–20 (.06–1.3 Gm.).

Quininæ Bisulphas, Quinine Bisulphate, $C_{20}H_{24}N_2O_2H_2SO_4 + 7H_2O$, *official*.—(Syn., Chininum Bisulfuricum, Quininæ Sulphas Acidus; Fr. Sulfate acide (Bisulfate) de Quinine; Ger. Saures Chinin-Sulfat.) It is in white crystals or needles, odorless, bitter, no residue, soluble in 10 parts water, 32 alcohol. *Test:* Gives white precipitate with ammonia water soluble in excess, also white precipitate with barium chloride T. S., insoluble in hydrochloric acid. Should be kept dark, in well-stoppered bottles. Dose, gr. 1–20 (.06–1.3 Gm.).

Quininæ Hydrobromas, Quinine Hydrobromate, $C_{20}H_{24}N_2O_2$-HBr + H_2O, *official*.—(Syn., Chininum (Hydrobromicum) Hydrobromatum; Fr. Bromhydrate de Quinine; Ger. Chinin-Hydrobromat.) It is in white silky needles, odorless, bitter, soluble in 54 parts water, 0.6 alcohol, 12 chloroform, 6 ether, no residue. *Test:* Precipitate aqueous solution with soda T. S., filter, supersaturate filtrate with acetic acid, add chloroform + chlorine water, shake, when chloroform separates with yellow color. Should be kept dark, in well-stoppered bottles. Dose, gr. 1–20 (.06–1.3 Gm.).

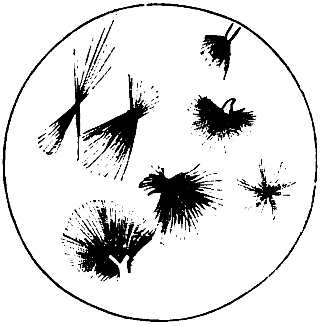
Quininæ Hydrochloras, Quinine Hydrochlorate, $C_{20}H_{24}N_2O_2HCl + 2H_2O$, *official*.—(Syn., Chininum Hydrochloricum, Muriate (Hydrochloride) of Quinine; Fr. Chlorhydrate de Quinine; Ger. Chinin-Hydrochlorid, Salzsaures Chinin.) It is in white silky needle-shaped crystals, odorless, bitter, soluble in 34 parts water, 3 alcohol, 9 chloroform, no residue. *Tests:* 1. Get white precipitate with silver nitrate T. S., insoluble in nitric acid. 2. Aqueous solution + sulphuric acid should not be turbid (abs. of barium), nor more than slightly turbid, with barium chloride T. S. (limit of sulphate). Should be kept dark, in well-stoppered bottles. Dose, gr. 1–20 (.06–1.3 Gm.).

Quininæ Sulphas, Quinine Sulphate, $(C_{20}H_{24}N_2O_2)_2H_2SO_4 + 7H_2O$, *official*.—(Syn., Quiniæ Sulphas, Sulfas Quinicus; Fr. Sulfate de Quinine; Ger. Chininum Sulfuricum, Chinin-Sulfat, Schwefelsaures Chinin.) It is in white, silky needle crystals, odorless, bitter, colors on exposure, soluble in 740 parts water, 65 alcohol, 40 glycerin, freely in dilute acids, no residue. *Tests:* 1. Aqueous solution + potassium iodide T. S. gives no effect (dif. from quinidine sulphate). 2. With barium chloride T. S. gives white precipitate, insoluble in hydrochloric acid. Should be kept dark, in well-stoppered bottles. Dose, gr. 1–20–40 (.06–1.3–2.6 Gm.).

Quininæ Valerianas, Quinine Valerianate, $C_{20}H_{24}N_2O_2C_5H_{10}O_2 + H_2O$, *official*.—(Syn., Quiniæ Valerianas; Fr. Valerianate de Quinine; Ger. Chininum Valerianicum, Baldriansaures Chinin.) It is in nearly white lustrous crystals, slight odor of valerianic acid, bitter, soluble in 100 parts water, 5 alcohol, no residue. *Test:* Gives slight turbidity with barium chloride T. S. (limit of sulphate). Should be kept dark, in well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.).

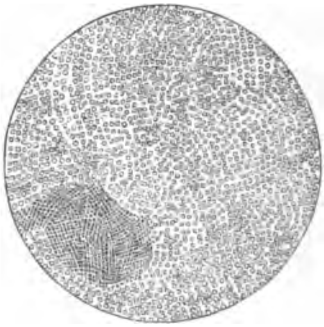
Quinidina, Quinidine, $C_{20}H_{24}N_2O_2$.—This is isomeric with quinine, is fluorescent; with chlorine or bromine water + ammonia water gives emerald-green color or precipitate, and is precipitated from the other alkaloids by potassium iodide, but not by alkaline oxalates in neutral solution. Dose, gr. 1–30 (.06–2 Gm.).

FIG. 360.



Quinine sulphate; microscopic crystals.

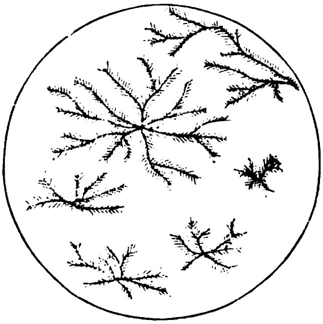
FIG. 361.



Quinine sulphate with KSCy; microscopic granules.

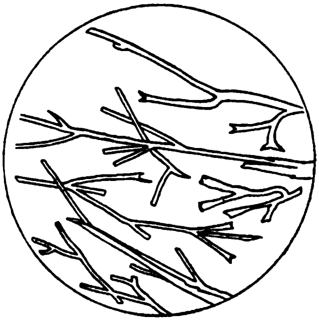
Quinidinæ Sulphas, Quinidine Sulphate, $(C_{20}H_{24}N_2O_2)_2H_2SO_4 + 2H_2O$, *official.*—(Syn., Sulphate of Conquinine; Fr. Sulfate de Quinidine; Ger. Chinidium (Conchininum) Sulfuricum, Schwefelsaures Chinidin, Conchinin-Sulfat.) It is neutral, in white silky needles, odorless, bitter, soluble in 100 parts water, 8 alcohol, 14 chloroform, dilute acids, insoluble in ether, no residue. *Tests:* 1. The aqueous solution + potassium iodide T. S. gives white precipitate (dif. from quinine sulphate). 2. 3 Cc. aqueous solution + little ammonia water

FIG. 362.



Quinidine sulphate with KSCy; microscopic crystals.

FIG. 363.



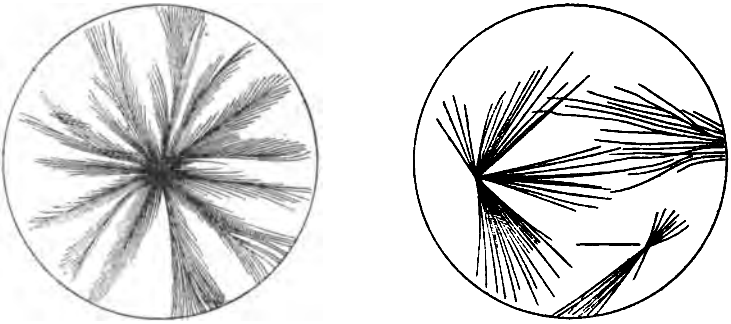
Cinchonine sulphate with KSCy; microscopic crystals.

gives white precipitate (quinidine), requiring more than 30 Gm. ammonia or ether to dissolve it (abs. other cinchona alkaloids). Should be kept dark, in well-stoppered bottles. Not so bitter as quinine, but is a good antipyretic and antiperiodic. Dose, gr. 1–30 (.06–2 Gm.).

Cinchonina, Cinchonine, $C_{19}H_{22}N_2O$, *official*.—(Syn., Cinchoninum; Fr. Cinchonine; Ger. Cinchonin.) It is in white, lustrous prisms or needles, odorless, at first nearly tasteless, becoming bitter, soluble in 116 parts alcohol, 3,760 water, 163 chloroform, 526 ether, no residue; precipitated by excess of ammonia water in acid solution, this precipitate soluble in 300 parts ether, freely soluble in ammonia water. *Test:* A solution in diluted sulphuric acid (1 in 1,000) should only give faint fluorescence (abs. of more than traces of quinine or quinidine). Dose, gr. 1–30 (.06–2 Gm.).

Cinchoninæ Sulphas, Cinchonine Sulphate, $(C_{19}H_{22}N_2O)_2H_2SO_4+2H_2O$, *official*.—(Syn., Cinchoniæ Sulphas; Fr. Sulfate de Cinchonine; Ger. Cinchonium Sulfuricum, Cinchoninsulfat, Schwefelsaures Cinchonin.) It is in hard, white, lustrous, prismatic crystals, odorless, bitter, soluble in 66 parts water, 10 alcohol, 78 chloroform, nearly insoluble in ether, no residue. When ammonia water added to aqueous solution the white precipitate responds to tests of cinchonine. Dose, gr. 1–30 (.06–2 Gm.).

FIG. 364. FIG. 365.



Cinchonidine sulphate with KSCy; microscopic crystals.

Cinchonidina, Cinchonidine, $C_{19}H_{22}N_2O$.—This is isomeric with cinchonine, is non-fluorescent; with chlorine or bromine water + ammonia water get white color or precipitate; nearly insoluble in ether, precipitated from the other alkaloids by sodium tartrate. Dose, gr. 1–30 (.06–2 Gm.).

Cinchonidinæ Sulphas, Cinchonidine Sulphate, $(C_{19}H_{22}N_2O)_2H_2SO_4 + 3H_2O$, *official*.—(Syn., Cinchonidinum Sulfuricum; Fr. Sulfate de Cinchonidine; Ger. Cinchonidin-Sulfat.) It is neutral, in white silky crystals, odorless, bitter, soluble in 70 parts water, 66 alcohol, 1,316 chloroform, insoluble in ether, no residue. Ammonia water added to aqueous solution gives white precipitate (cinchonidine) slightly soluble in ammonia, and soluble in 75 parts ether. *Tests:* 1. With barium chloride T. S. gives white precipitate insoluble in hydrochloric acid. 2. Diluted sulphuric acid solution (1 in 1,000) should give only faint blue fluorescence (abs. more than traces of quinine or quinidine sulphates). 3. 0.5 Gm. + 20 Cc. water, macerate, agitate, add 0.5 Gm. potassium sodium tartrate, shake occasionally for an hour, to filtrate add 1 drop ammonia water, should get only slight turbidity (abs. more than traces of cinchonine and quinidine sulphates). Dose, gr. 1–30 (.06–2 Gm.).

Quinami(n)a, Quinamine, $C_{19}H_{24}N_2O_2$.—In long, white prisms, non-fluorescent, nearly tasteless, acid solution very bitter, soluble in ether, hot alcohol.

Chinoidinum, Chinoidine, Quinoidine.—Official, 1880–1890. A blackish, amorphous alkaloid, resulting from evaporation of mother-liquor of the preceding alkaloids, being one-half the strength of quinine. Dose, gr. 2–30 (.13–2 Gm.).

Quinic Acid (Kinic, Chinic or Cinchonic), $C_7H_{12}O_6$.—5–9 p. c.

Quinovic Acid (Kinovic), $C_{32}H_{48}O_6$.—Tasteless, shining crystals.

Cincho-tannic Acid (Quino-tannic), $C_{14}H_{16}O_9$.—3–4 p. c.

The alkaloids are combined with one or more of these acids; the first with sulphuric acid and manganese dioxide, yielding kinone, $C_6H_4O_2$; the two former producing quinates (kinates) and quinovates (kinovates), as quinate (kinate) of quinine, lime, etc.; the last acid (glucoside) is the soluble red coloring matter, and when boiled with sulphuric acid gives sugar and cinchonic-red.

Quinovin (Kinovin, Chinovin, Quinovic Bitter), $C_{30}H_{48}O_8$.—Bitter glucoside; to alcoholic solution add hydrochloric acid gas, get quinovic (kinovic) acid and quinovin (kinovin) sugar (mannitan).

Cinchona-red, $C_{28}H_{22}O_{14}$.—This is from cincho-tannic acid, is soluble in alcohol and alkaline solutions. Red cinchona bark may contain 10 p. c.

Assay.—The amount of alkaloids is so variable in cinchona barks of close resemblance that physical appearance cannot be relied upon as an accurate guide to value. There are, therefore, several recognized methods of determining alkaloidal strength. 1. The U. S. P., 1890, method consists in macerating 4–6 hours, with occasional agitation, the powdered bark, with a mixture of alcohol 19 volumes, chloroform 5, ammonia water 1, evaporating filtrate, dissolving residue in acidulated water, precipitating with potassa V. S.; the precipitate can be redissolved in chloroform, evaporated. 2. The U. S. P., 1880, method consisted in mixing powdered bark with $Ca(OH)_2$ and water to a thin paste, macerating several days, evaporating to dryness, digesting mass in alcohol (or benzene 3 vols. + amylic alcohol 1) until exhausted; to filtrate add sulphuric or hydrochloric acid, distil off alcohol, precipitate with soda. 3. Percolate drug with acidulated (HCl) water, precipitate with soda.

PREPARATIONS.—I. CINCHONA (*C. Calisaya* and *C. officinalis*): 1. *Extractum Cinchonæ.* Extract of Cinchona. (Syn., Extract of Calisaya

Bark; Fr. Extrait de Quinquina jaune; Ger. Extractum Chinæ Spirituosum, Weingeistiges China-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 300 Cc. + water 100, finishing with diluted alcohol q. s. Dose, gr. 5–15 (.3–1 Gm.).

2. *Extractum Cinchonæ Fluidum.* Fluid Extract of Cinchona. (Syn., Br. Extractum Cinchonæ Liquidum, Extractum Chinæ Calisayæ Fluidum; Fr. Extrait liquide de Quinquina jaune; Ger. Flüssiges China-Extrakt, Kalisayarinden-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with glycerin 20 Cc., alcohol 80, finishing with alcohol 80 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

3. *Infusum Cinchonæ.* Infusion of Cinchona. (Syn., Br. Infusum Cinchonæ Acidum, Acid Infusion of (Yellow) Calisaya Bark; Fr. Tisane Acidulée de Quinquina; Ger. Kalisaya-Rindenaufguss, Saurer China-aufguss.)

Manufacture: 6 p. c. Mix aromatic sulphuric acid 1 Cc. with water 50 Cc., with this percolate cinchona 6 Gm., finishing with water q. s. 100 Cc. Dose, ℥ss–2 (15–60 Cc.).

4. *Tinctura Cinchonæ.* Tincture of Cinchona. (Syn., Tincture of Yellow Cinchona—Peruvian Bark, Tinctura Cinchonæ Flavæ; Fr. Teinture de Quinquina (jaune); Ger. Chinatinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with glycerin 7.5 Cc., alcohol 67.5, water 25, finishing with alcohol 73 p. c., q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

II. CINCHONA RUBRA (*C. succirubra*): 1. *Tinctura Cinchonæ Composita.* Compound Tincture of Cinchona. (Syn., Huxham's Tincture of Bark; Compound Tincture of Peruvian Bark; Fr. Teinture de Quinquina composée, Elixir fébrifuge d'Huxam; Ger. Tinctura Chinæ Composita, Zusammengesetze Chinatinktur.)

Manufacture: 10 p. c. Macerate, percolate red cinchona 10 Gm. + bitter orange peel 8, serpentaria 2, with glycerin 7.5 Cc., alcohol 85, water 7.5, finishing with alcohol 92 p. c., q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

III. QUININA: 1. *Ferri et Quininæ Citras*, 12 p. c. Dose, gr. 5 (.3 Gm.).

2. *Ferri et Quininæ Citras Solubilis*, 12 p. c. Dose, gr. 5 (.3 Gm.). Prep.: *Vinum Ferri Amarum*, 5 p. c. Dose, ʒj–2 (4–8 Cc.).

IV. QUININÆ SULPHAS: 1. *Syrupus Ferri, Quininæ et Strychninæ Phosphatum*, 3 p. c. Dose, ʒj–2 (4–8 Cc.).

Unoff. Preps.: Decoction, 6 p. c. Dose, ℥ss–2 (15–60 Cc.). *Warburg's Tincture* (*Antiperiodic Tincture*). Rhubarb 4 Gm., angelica 4, elecampane 2, saffron 2, fennel 2, gentian 1, zedoary 1, cubeb 1, myrrh 1, white agaric 1, camphor 1, quinine sulphate 11, diluted alcohol q. s. 555 Cc. To this may, or may not be added extract of aloes 8 Gm. Dose, ʒj–4 (4–15 Cc.).

PROPERTIES.—Tonic, antiperiodic, febrifuge, astringent, stomachic, antiseptic, prevents fermentation and putrefaction. The S. American

Indians still think it poisonous and always use their milder remedies for fevers. The Ecuador Cascarilleros believe their red bark is only used for dyeing. It is thought the Jesuits first discovered its medical properties and not the natives, hence the name Jesuit's powder. They sold it for its weight in silver, grain for grain. Sir Robert Talbot cured Charles II. of tertian fever with this in 1679, and then sold the secret to Louis XIV., of France, who published it in 1681. The bark is astringent, the alkaloids are not. Small doses increase appetite, saliva, gastric juice, peristalsis, heart action, cerebral functions, excretion of waste products; moderate doses diminish amount of urea, uric and phosphoric acids, interfere with oxygen-carrying function of red and prevent migration of white corpuscles, reduce fever by destroying or rendering inert the infective agent causing it, and by diminishing metabolism in the tissue. Large doses depress heart, produce gastric irritation, eructation, chill and fever paroxysms, headache, dizziness, perspiration. Also quinine, if taken when not indicated, may produce fever, constriction of the head, ringing in the ears, vertigo, staggering, deafness, headache, delirium—*cinchonism.* Inasmuch as this will produce that which it cures, Hahnemann, it is said, was influenced by the fact, along with some others, to revive and reëstablish homœopathy as based upon *similia similibus curantur.* Quinidine and cinchonidine are similar to quinine, but cinchonidine produces less head symptoms. Cinchonine is the weakest alkaloid, but causes much headache and muscular weakness.

USES.—Atonic dyspepsia, convalescence, gastric catarrh, asthma, bronchitis, to promote uterine contraction in labor, amenorrhœa, enlarged spleen.

Quinine as a specific in malaria, acting as a direct poison to the *plasmodium malariæ*, which, infesting the blood, cause the trouble. In intermittents give gr. 10 (.6 Gm.) of sulphate in sweating stage, and same quantity five hours before the next paroxysm; in the intervals of paroxysms give arsenic. In remittents give gr. 20–30 (1.3–2 Gm.) at a dose, once or twice daily, until temperature reduced. In typhus and typhoid fevers, variola, pneumonia, pyæmia, septicæmia, neuralgia, scarlet fever, erysipelas, measles, skin troubles, whooping-cough, hay fever, to stimulate uterine contraction in labor.

Cinchona bark itself is not much used now, from its excessive bulkiness, and owing to its alkaloids representing in such a concentrated form the true medical properties without any astringency.

ADMINISTRATION.—The pill, capsule or tablet disguises best the taste, but solutions are most effective, and their taste can be modified by liquorice, chocolate, glycyrrhizin, yerba santa syrup or fluid extract, etc., in which condition the alkaloid should never be dissolved with acids, but simply suspended with mucilage.

Poisoning: Give potassium bromide and hydrobromic acid, and if associated with quinine will act as preventive; may need cardiac and respiratory stimulants. Morphine counteracts its cerebral action, atropine its nervous, cardiac, and antipyretic effects.

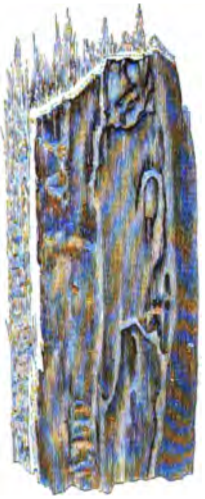
Incompatibles: Agents promoting waste: salts of mercury, copper, zinc, lead; tannin with decoction or infusion. Alkalies—alkaline carbonates, alkaline earths and iodine preparations with the alkaloidal solutions, the latter forming insoluble compounds, and all the rest precipitating them.

Synergists: Constructive agents, iron, salicylic acid, arsenic, eucalyptus, carbolic acid, creosote.

Allied Barks:

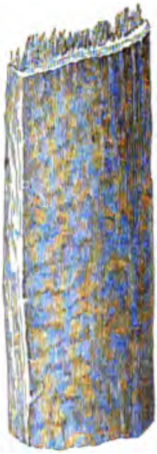
1. *Maracaibo* or *Hard Yellow Bark* (*C. cordifo'lia*).—This constitutes nearly all of the wild-grown bark: contains 2½ p. c. of alkaloids.
2. *Pitaya Bark* (*C. pitaye'nsis*).—Smooth, with circular scars, liber reddish cinnamon-brown, splintery, powder brownish-yellow.

FIG. 366.



Cinchona scrobiculata bark.

FIG. 367.



Cinchona pubescens bark.

3. *Cusco Bark* (*C. pube'scens*).—Pale brownish-yellow to whitish, warty, liber cinnamon-colored, fracture coarse-splintery.
4. *Carthagena Bark* (*C. lancifo'lia* and *C. cordifo'lia*).—Like the Cusco, only liber is reddish, fracture fibrous.
5. *Lima* or *Huanuco Bark* (*C. peruvia'na*, *C. ni'tida*, *C. micra'ntha*).—In quills and half quills.
6. *Huamalies Bark* (*C. micra'ntha*, *C. purpu'rea*, *C. glanduli'fera*).—In quills and half quills.
7. *Jaen* or *False Loxa Bark* (*C. Humboldtia'na*).—A very inferior variety.

Spurious Cinchona Barks:

1. *Cuprea* or *Copper Colored Bark* (*Remi'gia Purdiea'na*, *C. peduncula'ta*).—Colombia, Andes. Contains alkaloids 3 p. c.—quinine 2 p. c., the rest being quinidine, cinchonine, quinovin. The quinine exists

as homoquinine and cupreine, $C_{19}H_{22}N_2O_2$; this latter is red-brown with ferric chloride, and converted into quinine by methyl chloride.

2. Barks belonging to other genera as *Cascari′lla*, *Ladenbe′rgia*, *Nau′clea*, *Exoste′ma*, etc. All distinguished by *Grahe's test:* The powdered bark heated in a dry test-tube yields a tarry distillate of red color; this test applies to cuprea bark, but with these genera have no reaction. Some of these barks resemble cinchona, others do not.

Allied Plant:

1. *Mi′tchella re′pens*, *Partridge-berry*, *Squaw-vine.*—N. America. Creeping evergreen of the woods; leaves 12 Mm. (½′) long, ovate; flowers purplish, fruit a scarlet-red berry; contains saponin-like substance, resin, wax, gum, sugar. Tonic, astringent, diuretic; resembles chimaphila and viburnum, they all being sometimes prescribed together. Dose, ʒss–1 (2–4 Gm.).

80. CAPRIFOLIACEÆ. Honeysuckle Family.

Kap-ri-fo-li-a′se-e. L. *Caprifoli-um* + aceæ—*caper*, a goat, + *folium*, leaf; *i. e.*, referring to the climbing and capering plant-habit, like a goat. Trees, shrubs, herbs. Distinguished by showy, sweet-scented flowers; leaves opposite, exstipulate; calyx 4–5-cleft, superior, persistent, tube coherent with 2–5-celled ovary; corolla 4–5-cleft, bearing as many stamens on its tube; regular or irregular; ovary 1–6-celled, inferior; filaments in pairs at each sinus; anthers 1-celled; fruit berry or drupe; temperate climates; emetic, purgative, astringent, diuretic, sudorific, acrid, poisonous.

Genera: 1. **Sambucus.** 2. **Viburnum.**

SAMBUCUS. SAMBUCUS (ELDER).

Sambucus canadensis, *Linné.* } The flowers.

Habitat. N. America, in damp places. (Canada to Georgia, west to Rocky Mts.)

Syn. American—Common—Sweet or Rob Elder. Elder-blow (berries). Br. Sambuci Flores. Fr. (Fleurs de) Sureau. Ger. Holunderblüthen, Flieder (blumen), Hollunder.

Sam-bu′cus. L. *sambuca*, musical instrument, triangular stringed, with sharp, shrill tone, said to have been made of this *elder*.

Can-a-den′sis. L. Canadian; *i. e.*, abundant there.

PLANT.—Semi-shrubby perennial, slightly woody, 1.5–3 M. (5–10°) high; stem branching, covered with rough, pitted-gray bark, with large central white pith, branches and leaf-stalks smooth; leaves 15–30 Cm. (6–12′) long, imparipinnate; leaflets 3–5 pairs, 5–10 Cm. (2–4′) long, ovate, acuminate, serrate, smooth, shining, deep-green, midribs pubescent; fruit Sept., ovoid, 6 Mm. (¼′) long, drupe, red then purplish-black—contains three 1-seeded nutlets. FLOWERS, June, in large corymbose cymes, 5-rayed, flat, 10–12.5 Cm. (4–5′) broad, each flower 5 Mm. (⅕′) broad, shrivelled after drying, calyx superior, 5-toothed, corolla cream-white, when dry pale-brownish-yellow, wheel-shaped, 5-toothed, 5 stamens on the short tube; odor peculiar; taste aromatic, bitter; peduncles and pedicels should be rejected. *Solvents:* hot water or alcohol. Dose, ʒss–1 (2–4 Gm.).

ADULTERATIONS.—With flowers of allied species, also spiræa, yarrow, distinguished by color, odor and appearance of stems.

Commercial.—The cymes are gathered, put into heaps, and allowed to sweat a few hours, whereupon corollas falling off are sifted and quickly dried. If kept any length of time they become worm-eaten unless sodium chloride or some other preservative agent be added.

CONSTITUENTS.—Volatile oil ⅓–½ p. c., resin, fat, wax, (mucilage, sugar, tannin, pectin albuminoids).

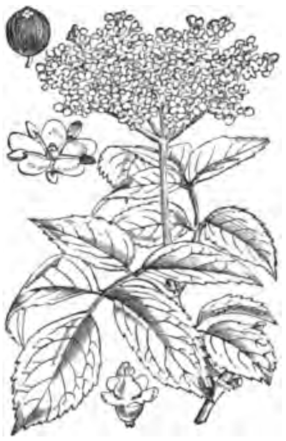
Volatile Oil.—Yellowish, limpid, mostly butyraceous consistence, odor strong; taste warm, bitter, cooling. The bark contains viburnic (valerianic) acid; also resin, tannin, potassium and calcium malates.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ʒss–1 (2–4 Cc.). *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Inspissated Juice.* Dose, ʒj–3 (4–12 Cc.). *Water* (*Aqua Sambuci;* flowers 1 part + water 4, distil 1 part). *Wine. Ointment.*

PROPERTIES.—Stimulant, carminative, diaphoretic, sudorific, laxative, diuretic, alterative, flavoring.

USES.—Ancients used the flowers for the preceding virtues, but now mostly employed externally in fomentation, poultice, ointment for rheumatism, local pain, burns, blisters, erysipelas, hemorrhoids, abscesses; the water for cooling application to eyes, inflamed surfaces, perfumery; the ointment with sulphur for scabies; infusion to expel maggots. The bark and green leaves for same purposes; juice of fruit and root for rheumatism, syphilis, dropsy, epilepsy, chronic diseases, laxatives. If fruit juice allowed to ferment get palatable elderberry wine, purple color, used largely for adulterating port wine. The flowers poison peacocks, the berries likewise hens, while cattle will not feed on them, and caterpillars, moths, etc., avoid them.

FIG. 368.



Sambucus canadensis.

Allied Plants:

1. *Sambucus ni′gra.*—Europe; tree, 4.5–6 M. (15–20°) high, 10–15 Cm. (4–6′) thick, leaflets ovate-oblong, acute, compound cymes smaller, hairy in axils of inflorescence, otherwise same as official. *S. E′bulus, Dwarf Elder.* All parts have a strong, disagreeable odor, bitterish, acrid taste, the 4-seeded fruit, resembling elderberries, has a more agreeable taste; used occasionally as laxative; *S. madere′nsis.* Madeira, less aromatic, but closely resembling *S. nigra.*

VIBURNUM OPULUS. VIBURNUM OPULUS (CRAMP BARK).

Viburnum Opulus, *Linné.* } The bark (of the stem).

Habitat. United States, in thickets. New Brunswick, far west, and south to Penn.

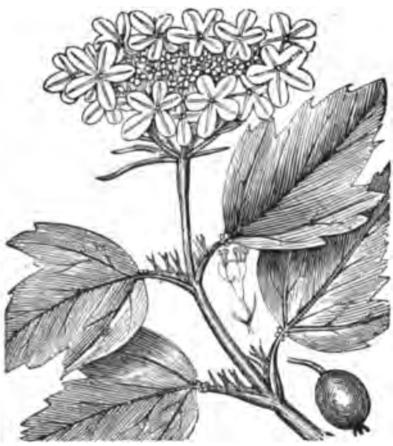
Syn. High Cranberry, Cranberry Tree, Marsh or May Rose, White Dogwood, Dog Rowan or Gaiter Tree, Gatten, Cherrywood, Rose or Water Elder, Squaw Bush, Whitten Tree, Wild Guelder Rose, Cranberry Tree Bark; Fr. Écorce d'Obier; Ger. Wasserholderrinde.

Vi-bur'num. L. the wayfaring tree, fr. *vieo*, *viere*, to tie; *i. e.*, the pliability of its branches.

Op'u-lus. L. a maple; *i. e.*, its resemblance to some of the maples.

PLANT.—Handsome perennial shrub, 1.3–3.5 M. (4–12°) high; stem smooth, branches spreading; leaves 3–5-ribbed, strongly 3-lobed, broadly truncate at base, lobes dentate, petioles with two glands at apex; flowers June, 7.5–10 Cm. (3–4') broad, greenish-white peduncled cymes; fruit 12 Mm. ($\frac{1}{2}$') long, ovoid, red, acrid, substituted for cranberries, whence its name. The well-known Snowball tree, or Guelder Rose, is a cultivated variety, having entire cyme turned into showy, sterile flowers. BARK, in flat curved bands, quills about 30 Cm. (12') long, 1–1.5 Mm. ($\frac{1}{25}$–$\frac{1}{16}$') thick, ash-gray, with transverse brownish warts, due to abrasion, and blackish dots, also longitudinal black lines or thin ridges; underneath the easily removed corky layer, the bark is pale-brownish-red; inner surface brownish-white; fracture tough, tissue separating in layers, the outer having irregular groups of stone-cells, surrounded by parenchyma; inodorous; taste astringent, bitter. *Solvents:* hot water; diluted alcohol. Dose, ʒss–2 (2–8 Gm.).

FIG. 369.



Viburnum Opulus.

CONSTITUENTS.—Viburnin, Valerianic acid, resin (brown, bitter), tannin, sugar, oxalates, citrates, malates, ash 8–9 p. c. = earthy carbonates and phosphates (calcium, magnesium, potassium).

Viburnin.—Bitter principle, whitish or greenish-yellow, bitter, neutral, resinous, soluble in alcohol, sparingly in water, no residue.

Valerianic Acid.—This is here sometimes called viburnic acid, both being identical.

PREPARATIONS.—1. *Extractum Viburni Opuli Fluidum.* Fluid Extract of Viburnum Opulus. (Syn., Fluid Extract of Cramp Bark.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Decoction*, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Hayden's Viburnum Compound.* This latter contains also *Dioscore'a villo'sa, Scutella'ria lateriflo'ra,* and aromatics.

Properties.—Diuretic, tonic, antispasmodic, nervine, astringent.

Uses.—To prevent abortion, in nervous diseases of pregnancy, dysmenorrhœa, after-pains, ovarian irritation, menorrhagia, asthma, hysteria.

VIBURNUM PRUNIFOLIUM. BLACK HAW.

Viburnum prunifolium, *Linné.* } The bark (of the stem).

Habitat. United States, New York to Florida, west to Mich., Kan., Tex.; dry soil.

Syn. Sweet Viburnum, Sheep-berry, Boots, Sloe, Stag-bush.

Pru-ni-fo'li-um. L. fr. *prunum*, a plum, + *folium*, a leaf, with a plum leaf; *i. e.*, leaves resemble those of the plum.

Plant.—Tall, handsome shrub 3–6 M. (10–20°) high; leaves 2.5–5 Cm. (1–2′) long, 12–16 Mm. (½–⅔′) wide, opposite, smooth, shining, oval, obtuse, serrate, petioles slightly margined; flowers May, perfect, white cymes, sessile; fruit oval, black drupe (berry), sweet, edible. Bark, in thin pieces, quills, purplish-brown, with scattered warts, small black dots; when from old wood, grayish-brown; thin corky layer easily removed from green layer; inner surface whitish, smooth; fracture short; inodorous, astringent, bitter. Bark of the root is more bitter and of a dull-gray color, and is found on the market separate, as well as mixed with the official. *Solvents:* hot water; diluted alcohol. Dose, ʒss–2 (2–8 Gm.).

Constituents.—Viburnin, Valerianic acid, resin (brown, bitter), tannin, sugar, oxalates, citrates, malates, ash 8–9 p. c. = earthy carbonates and phosphates (calcium, magnesium, potassium).

Preparations.—1. *Extractum Viburni Prunifolii Fluidum.* Fluid Extract of Viburnum Prunifolium. (Syn., Fluid Extract of Black Haw Bark; Fr. Extrait liquide de Viburne; Ger. Flüssiges Viburnum-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Extract. Dose, gr. 3–10 (.2–.6 Gm.). *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Decoction*, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

Properties.—Diuretic, tonic, antispasmodic, nervine, astringent.

Uses.—In threatened abortion, nervous diseases of pregnancy, dysmenorrhœa, after-pains, ovarian irritation, menorrhagia, asthma, hysteria.

Allied Plants:

1. *V. obova'tum, Small Viburnum, Black Haw.*—S. United States; shrub 2.4 M. (8°) high, fruit black, leaves broadly obovate, leathery, bitter; also used as antiperiodic.

2. *Trio′steum perfolia′tum, Fever Root, Fever-wort, Horse-Gentian.* —The root (rhizome) official, 1820–1880. United States. Perennial herb 1–1.3 M. (3–4°) high, hirsute; leaves pubescent beneath, 15 Cm. (6′) long; flowers purplish, fruit dry yellow drupe, 12 Mm. (½′) long. Root 15–20 Cm. (6–8′) long, 15 Mm. (⅝′) thick, knotty, brownish-yellow, bitter, nauseous. Contains bitter principle, starch. Used as cathartic, emetic, diuretic, substitute for ipecac; in infusion, decoction, extract. Popular with Indians for fevers, amenorrhœa. Dose, gr. 15–30 (1–2 Gm.).

81. VALERIANACEÆ. Valerian Family.

Va-le-ri-a-na′se-e. L. *Valerian-a* + aceæ, fr. *Valerianus* or *Valerius*, who first used it in medicine—*valere*, to be strong, healthful; *i. e.*, its odor and medicinal virtues. Herbs. Distinguished by possessing a strong-scented volatile oil; leaves opposite, exstipulate; calyx superior, tube adnate to ovary; corolla mostly 5-lobed, tubular, epigynous; stamens 1–4, inserted on corolla-tube; ovary, 1 fertile cell, 2 abortive or empty; fruit dry, often pappose; temperate climates; stimulant, antispasmodic, tonic (vol. oil).

Genus: 1. **Valeriana.**

VALERIANA. VALERIAN.

Valeriana officinalis, *Linné.* } The rhizome and roots.

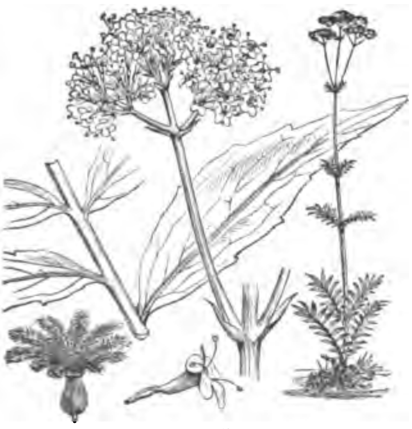
Habitat. Europe, N. Asia, in moist as well as dry localities, banks of streams, naturalized in New England, and New York; cultivated.

Syn. Wild, Great Wild, English, German, Common, Cat's, Vermont or American English Valerian, Setwall, Vandal Root, All Heal, Radix Valerianæ Minoris; Fr. Racine de Valériane. Ger. Radix Valerianæ, (Wilde) Baldrianwurzel.

Va-le-ri-a′na. L. see etymology, above, of Valerianaceæ.

Of-fi-ci-na′lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

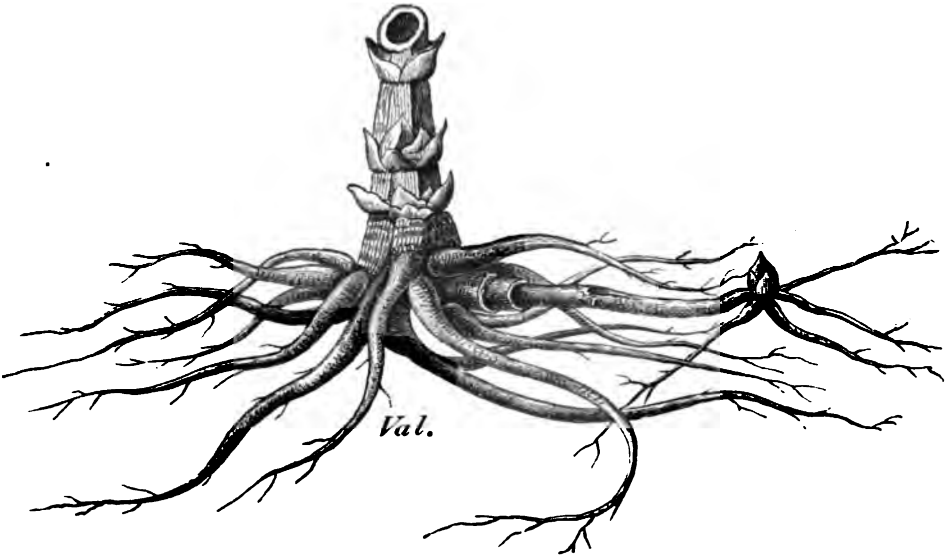
FIG. 370.



Valeriana officinalis.

PLANT. — Large perennial herb; stem .6–1.3 M. (2–4°) high, branched at top, cylindrical, hollow, fluted and channelled, often hairy; leaves imparipinnate with long clasping petioles; leaflets 4–10 pairs, 2.5–6.5 Cm. (1–2½′) long, lanceolate, dentate; flowers small, white, or rose-color, agreeably odorous, terminal corymbs, corolla 5-lobed, stamens 3, sessile; fruit, capsule, 4 Mm. (⅙′) long, plano-convex, compressed, 4-ribbed, pale-brown, 1-seeded, oblong-ovate. RHIZOME, 18–37.5 Mm. (¾–1½′) long, 12–18 Mm. (½–¾′) thick, upright, subglobular or obconical, truncate at both ends, yellowish-brown ; inside pale-brown, with narrow circle of white wood under the thin bark ; roots many, slender, brittle, brown, having slender ligneous cord and thick bark ; odor peculiar, stronger and unpleasant on keeping ; taste camphoraceous. *Solvents :* water ; alcohol. Dose, gr. 15–60 (1–4 Gm.).

FIG. 371.

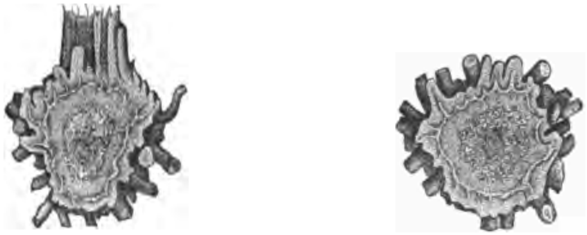


Valeriana officinalis ; rhizome, roots and rootlets.

ADULTERATIONS.—With rhizome and roots of *V. Phu'*, *V. dioi'ca*, *Cyna'nchum Vinceto'xicum*, *Vera'trum a'lbum*, *Si'um latifo'lium*, *Scabio'sa succi'sa*, and *S. arve'nsis*, also several ranunculaceous roots.

Commercial.—Valerian flourishes equally well in damp woods, meadows, dry places, etc., but has slight peculiarities dependent upon place where growing, which have led some to distinguish four varieties. They are all, however, one and the same thing giving us identical constituents. It is cultivated in England, Germany, Holland, United States (N. H., Vt., N. Y.), the rhizome being collected in early spring

FIG. 372.



Valeriana ; longitudinal and transverse sections.

or preferably autumn from dry soil plants; the tops are cut off in spring to prevent seeding, thereby strengthening the rhizome; this latter is dug, washed, dried (whole or slit) in kilns, packed tightly, and kept dry to prevent deterioration. Very little collected from wild plants, although these are stronger and smaller.

CONSTITUENTS.—Volatile oil ½–2 p. c., Valerianic acid, formic, acetic, malic acids, chatinine, tannin, resin, starch, mucilage, sugar.

Volatile Oil. (**Oleum Valerianæ,** *official,* 1880–1890.)—This is obtained by distilling with water; it is a pale-green liquid, pungent valerian odor, aromatic taste, sp. gr. 0.945, yellow and viscid on exposure, levogyrate. Contains: 1. a terpene—borneene, $C_{10}H_{16}$, boiling at 157° C. (315° F.); 2. an alcohol—borneol (liquid, and solid crystalline compound), $C_{10}H_{18}O$, with the liquid portion chromic acid yields camphor along with formic, acetic and valerianic acids, these latter being likewise present in old rhizomes from slow oxidization of this $C_{10}H_{18}O$; 3. an ether—borneol, or borneol oxide, $(C_{10}H_{17})_2O$, greenish syrupy oil, but colorless when rectified, along with formic, acetic, and valerianic esters, which, by oxidization, form their respective acids. Very recent investigators claim these components to be pinene, camphene, borneol, and the formic, acetic, and iso-valerianic esters of borneol. Dose, ♏j–5 (.06–.3 Cc.).

Valerianic Acid. (**Acidum Valerianicum,** $C_5H_{10}O_2$, *official,* 1870–1880.)—Not in fresh rhizome, but results from oxidation of the volatile oil on exposure; this is, however, mostly obtained by oxidizing amylic alcohol with sulphuric acid and potassium dichromate. It is an oily liquid, volatile, with characteristic odor, salts sweet-tasted.

PREPARATIONS.—1. *Extractum Valerianæ Fluidum.* Fluid Extract of Valerian. (Syn., Fr. Extrait liquide de Valériane; Ger. Flüssiges Baldrian-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

2. *Tinctura Valerianæ.* Tincture of Valerian. (Syn., Fr. Teinture de Valériane; Ger. Baldriantinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

3. *Tinctura Valerianæ Ammoniata.* Ammoniated Tincture of Valerian. (Syn., Tinctura Valerianæ Composita; Fr. Teinture de Valériane Ammoniacale; Ger. Ammoniakalische Baldriantinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with aromatic spirit of ammonia q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Extract. Dose, gr. 5–10 (.3–.6 Gm.). *Abstract.* Dose, gr. 5–20 (.3–1.3 Gm.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). *Water* (*Aqua*), *Syrup.*

PROPERTIES.—Similar to other drugs having a volatile oil. Stimulant, anodyne, nervine, antispasmodic, vermifuge, no narcotic effect; increases heart action and temperature, causing exhilaration, stimulates circulation, secretion and peristalsis of the stomach and intestines; it is eliminated by kidneys, bronchial and genito-urinary mucous membranes; if used continuously may give melancholy, hysteria. Large doses cause nausea, diarrhœa, urination, delirium, lessens motility, sensibility, and reflex excitability; the oil paralyzes the brain, spine, slows pulse, lowers blood-pressure.

Uses.—Hysteria, hypochondriasis, hemicrania, nervous coughs, whooping-cough, diabetes, delirium tremens, typhoid state, dysmenorrhœa, vertigo, epilepsy, worm convulsions, flatulence, reflex neuralgia.

Allied Plants:

1. *V. Phu′*.—W. Asia, S. Europe; tall perennial; rhizome (*Radix Valerianæ Majoris*) is 10–15 Cm. (4–6′) long, 12 Mm. ($\frac{1}{2}$′) thick, annulated, brown; *V. mexica′na* and *V. tolucca′na*. Mexico; all three yield valerianic acid, odor and taste weaker than official.
2. *V. ce′ltica* (*Nardus Spica celtica*).—Alps, and *Nardo′stachys Jatama′nsi*, *Na′rdus i′ndica* (*Spica′nardi*) or true spikenard. India; the former has valerian odor, the latter that of serpentaria.

82. CUCURBITACEÆ. Gourd Family.

Ku-ker-bi-ta′se-e. L. *Cucurbit-a* + aceæ, a gourd, fr. *curvitas*, crookedness; *i. e.*, referring to the fruit's shape. Herbs. Distinguished by possessing acrid, bitter, purgative properties, succulent nature, prostrate or climbing, with tendrils; leaves and stem scabrous; flowers unisexual, calyx 5-toothed, tube adnate to the ovary; corolla 5's, perigynous; stamens mostly 3, usually united; ovary 1–3-celled, inferior; fruit succulent, pulpy, edible; seeds flat, many, exalbuminous; tropics; purgative (pulp), edible, poisonous.

Genera: 1. **Cucurbita.** 2. **Citrullus.** 3. **Ecballium.** 4. **Bryonia.**

PEPO. PUMPKIN SEED.

Cucurbita Pepo, *Linné.* } The seed.

Habitat. Tropic Asia, America; cultivated.

Syn. Pumpkin, Pompion, Cold Seeds, Semen Peponis. Fr. Semences de Potirons. Ger. Kürbissamen.

Cu-cur′bi-ta. L. see etymology, above, of Cucurbitaceæ.

Pe′po. L. fr. Gr. πέπων, pumpkin, old form, pompon, lit. cooked by the sun, ripe, mellow; *i. e.*, not eaten until ripe.

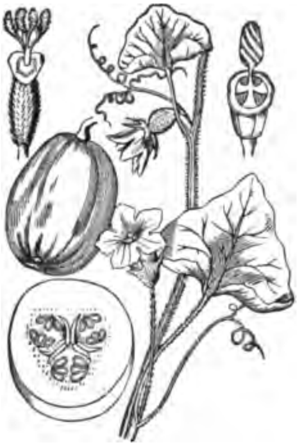
Plant.—Trailing annual; stem rough, hollow, hairy, 3–9 M. (10–30°) long, tendrils branched; leaves large, .25–.5 M. (10–20′) long, 15–30 Cm. (6–12′) wide, obtusely cordate, hispid, palmately 5-lobed, serrate, petioles 7.5–20 Cm. (3–8′) long; flowers July, large, 5–12.5 Cm. (2–5′) wide, yellow, bell-shaped, monœcious, axillary; anthers 3, syngenesious; fruit Oct., large, round, oblong, smooth, fleshy, yellow, furrowed, .25–.5 M. (10–20′) in diameter. Seed, 18 Mm. ($\frac{3}{4}$′) long, 9 Mm. ($\frac{3}{8}$′) wide, 1.5 Mm. ($\frac{1}{16}$′) thick, broadly ovate, flat, whitish, smoothish with shallow groove parallel to the edge, radical short, conical; cotyledons two, flat; inodorous; taste bland, oily. *Solvent:* alcohol. Dose, ℥j–2 (30–60 Gm.).

CONSTITUENTS.—Fixed oil 44 p. c., starch 32 p. c., acrid resin, proteids (myosin and vitellin), sugar, ash 3–4 p. c.

Some claim an alkaloid cucurbitine to be present and active, but probably the resin is the active principle which resides in the tegmen, or embryo.

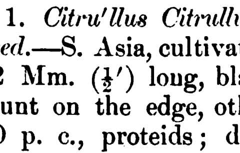
Fixed Oil.—This is removed by benzin, after which can treat seeds with alcohol, ether or chloroform to get out greenish-brown soft resin, which is acrid, bitter in taste; most of this oil can be expressed. The seed-infusion saturated with sodium chloride precipitates myosin, and when CO_2 is added vitellin separates which behaves like egg-yolk (due to its contained vitellin). The protein is possibly its emulsionizing principle.

FIG. 373.



Cucurbita Pepo.

FIG. 374.



Pumpkin seed; entire and longitudinally divided, showing embryo.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ℥ss–2 (15–60 Cc.). *Emulsion* (℥ij–4; 60–120 Gm. fresh seeds, deprived of testa, should be beaten into a paste with sugar + water or milk Oj; .5 L.). Dose, ℥v (150 Cc.) at two-hour intervals beginning at 10 o'clock A. M.

Patient must remain quietly in bed all day. On the night before, and also before breakfast give saline purgative to remove mucus, and about 3–4 hours after the pint (.5 L.) has been taken administer castor oil ℥j–2 (30–60 Cc.). Should fast the day previous to taking the medicine.

PROPERTIES AND USES.—Tænifuge, vermifuge, valuable from its freedom of taste and harshness of action, but has the disadvantage of uncertainty. Same treatment applies to tape and lumbricoid worms.

Allied Plants:

1. *Citru'llus Citrullus* (*Cucu'rbita* (*Cu'cumis*) *Citrullus*), *Watermelon Seed.*—S. Asia, cultivated. Fruit edible, very large; seed flat, ovate, 12 Mm. (½′) long, blackish, marbled, or orange-brown, ungrooved, blunt on the edge, otherwise like pumpkin seed. Contain fixed oil 30 p. c., proteids; diuretic, tænifuge, anthelmintic. Dose, ʒij–16 (8–60 Gm.).

COLOCYNTHIS. COLOCYNTH.

Citrullus Colocynthis, (*Linné*) *Schrader.* } The fruit deprived of its rind.

Habitat. S. and W. Asia, N. and S. Africa, in arid places, deserts. (Arabia, Syria, Egypt, Morocco, Cape of Good Hope, Greece, Spain, Japan; cultivated.)

Syn. Bitter Apple, Bitter Cucumber, Bitter Gourd, Colocynth Apple or Fruit. Br. Colocynthidis Pulpa, Poma Colocynthidis. Fr. Coloquinte. Ger. Fructus Colocynthidis, Koloquinthen, Coloquinthenapfel.

CUCURBITACEÆ.

Ci-trul′lus. L. *citrus*, an orange, Gr. *κίτρον*, citron, Ar. origin ; *i. e.*, named after color of the fruit when cut—orange red.

Col-o-cyn′this. L. fr. Gr. *κολοκυνθίς*, the classic name of the plant.

Plant.—Perennial, resembling very much the watermelon (*C. Citrullus*, an annual with larger, smoothish leaves, and larger, sweeter fruit) ; stem herbaceous, angular, hispid ; leaves many-lobed, hairy, 2.5–10 Cm. (1–4′) long, sub-palmately cleft on long hispid petioles ; tendrils, with which the vine climbs, short, branching ; flowers large, monœcious, both kinds being similar, solitary, yellow. Fruit, globular, 5–10 Cm. (2–4′) thick, size of a small orange, smooth, greenish, mottled, when peeled whitish-yellow, 1-celled (though apparently 6-celled), inside soft, spongy, when dry breaking into three wedge-shaped pieces, each having near the pericarp numerous flat, ovate, brown seeds ; inodorous, very bitter. The pulp should alone be used, the seeds being separated and rejected ; the former constitutes one-fourth, the latter three-fourths of the entire fruit, and these (seeds) possess very little activity, although they are slightly bitter and contain 17 p. c. of fixed oil. When seeds deprived of testa the remaining kernel is one-half oil, owing to which property they are used in Africa for food, bread, etc. *Solvents:* alcohol ; diluted alcohol ; water. Dose, gr. 2–10 (.13–.6 Gm.) ; laxative gr. 2–5 (.13–.3 Gm.) ; drastic purgative, gr. 5–10 (.3–.6 Gm.), ter die.

Commercial.—Colocynth is a very old medicine, being cultivated in gardens of England since 1551. Two varieties are recognized : 1. *Peeled, Turkey.* 2. *Unpeeled, Mogador.* The former usually is imported from Spain, Syria, etc., already peeled, it is the best quality and smaller in size ; the latter has smooth brownish-yellow exterior. The fruit is gathered in autumn when turning yellow, then peeled and dried quickly by sun or fire ; not used or known by native physicians as a cathartic, but only for moths.

Constituents.—Colocynthin 0.6 p. c., Colocynthitin, pectin, gum, no starch, ash 8–14 p. c. ; Seeds have bitter principle, fixed oil 17 p. c., albuminoids 6 p. c., ash 2–3 p. c.

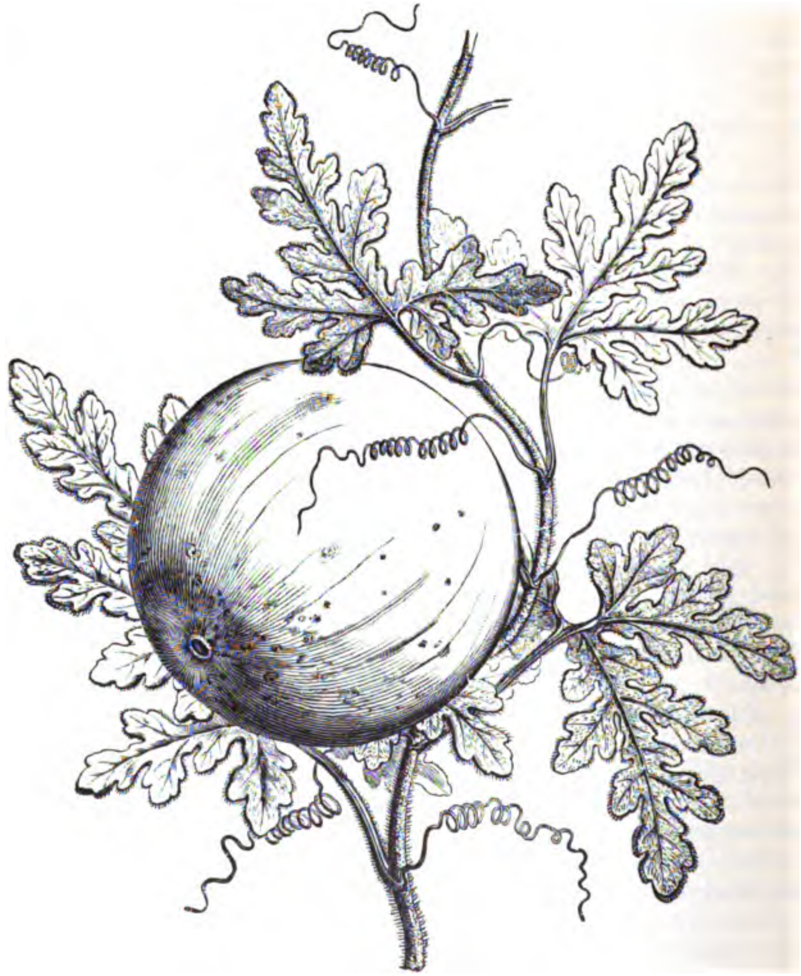
Colocynthin, $C_{56}H_{84}O_{23}$.—The chief cathartic principle ; an amorphous glucoside (bitter principle), obtained by exhausting with water the alcoholic extract, precipitating filtrate with lead acetate and subacetate ; the yellow filtered liquid is treated with H_2S to remove lead, filtered, then precipitated with tannin. This tannate of colocynthin is dissolved in alcohol, the tannin thrown down by lead subacetate, filtered liquid digested with animal charcoal, filtered, evaporated. It is a yellow powder, soluble in water, alcohol, boiled with diluted acids splits into sugar and resinous colocynthein. Dose, gr. ½–1 (.03–.06 Gm.)—hypodermically, gr. ⅙–⅓ (.01–.02 Gm.), by which method it is painful and should be associated with cocaine. The "Eclectic" resinoid, *colocynthin.* Dose, gr. ¼–1 (.016–.06 Gm.).

Colocynthitin (*citrullin*).—A resin left after treating alcoholic extract with cold water in preparing colocynthin, soluble in alcohol, ether, hot water.

PREPARATIONS.—1. *Extractum Colocynthidis.* Extract of Colocynth. (Syn., Extractum Colocynthidis Alcoholicum; Fr. Extrait de Coloquinte; Ger. Koloquinthen-Extrakt.)

Manufacture: Macerate 100 Gm. with diluted alcohol 350 Cc. for four days, strain and reserve liquid, then percolate with diluted alcohol 150 Cc., evaporate mixed tinctures. Dose, gr. ½–2 (.03–.13 Gm.).

FIG. 375.



Citrullus Colocynthis.

Prep.: *Extractum Colocynthidis Compositum.* Compound Extract of Colocynth. (Syn., Fr. Extrait de Coloquinte composé; Ger. Zusammengesetztes Koloquinthen-Extrakt.)

Manufacture: Melt purified aloes 50 Gm., add alcohol 10 Cc., soap 14 Gm., extract of colocynth 16, resin of scammony 14, heat until homogeneous, cool, add cardamom 6, reduce to fine powder. Dose, gr. 5–15 (.3–1 Gm.).

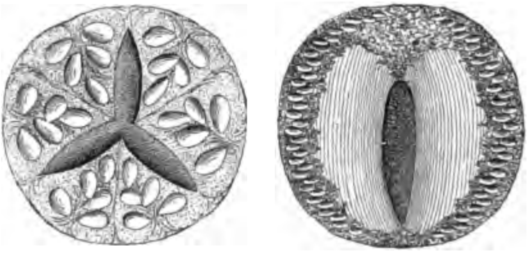
Preps. : 1. *Pilulæ Catharticæ Compositæ.* Compound Cathartic Pills. (Syn., Antibilious Pills; Fr. Pilules cathartiques composées ; Ger. Abführpillen.)

Manufacture: Compound extract of colocynth 8 Gm., calomel 6, extract of jalap 3, gamboge 1.5, water q. s. for 100 pills. Dose, 1–3 pills.

2. *Pilulæ Catharticæ Vegetabiles.* Vegetable Cathartic Pills. (Syn., Fr. Pilules cathartiques végétables ; Ger. Vegetabilische Abführpillen.)

Manufacture: Compound extract of colocynth 6 Gm., extract of hyoscyamus 3, extract of jalap 3, extract of leptandra 1.5, resin of podophyllum 1.5, oil of peppermint .8 Cc., water q. s. for 100 pills. Dose, 1–3 pills.

FIG. 376.



Peeled colocynth ; transverse and longitudinal section.

Unoff. Preps.: Tincture, 10 p. c. (alcohol). Dose, ʒss–1 (2–4 Cc.). *Fluid Extract.* Dose, ♏ij–10 (.13–.6 Cc.).

PROPERTIES.—Drastic and hydragogue cathartic, hepatic stimulant, diuretic ; small doses bitter, stomachic; large doses emetic, irritant poison, causing violent griping, dangerous bowel inflammation—gr. 90 (6 Gm.) has killed. It is very harsh and seldom used alone.

USES.—The Greeks and Arabians were unacquainted with its drastic effect, but prescribed it for its other properties. Now used as an evacuant, dropsy, melancholia, coma, apoplexy, paralysis, but never in pregnancy, nor where gastric or intestinal inflammation exists.

Poisoning: Evacuate stomach, give demulcents, opium, stimulants.

Allied Plants:

1. *Lu'ffa Luffa* (*ægypti'aca*), Egypt, and *L. opercula'ta,* Brazil. *Vegetable Sponge, Wash-rag Sponge, Gourd Towel.* 2. *Cu'cumis myrioca'rpus,* S. Africa. These produce analogous fruits, which have similar action to colocynth, while the derma of *Luffa* serves as sponge, 3. *Momo'rdica Balsa'mina, Balsam Apple,* E. India. Climbing plant also cultivated in gardens throughout the United States for its yellow cucumber-like fruit. This is soaked in whiskey and used domestically as a vulnerary.

ECBALLIUM. SQUIRTING CUCUMBER.

Elaterinum. Elaterin, $C_{20}H_{28}O_5$, *official.*

Ecballium Elaterium, (*Linné*) *A. Richard.* } A neutral principle from Elaterium, a substance deposited by the juice of this fruit.

Habitat. W. Asia, N. Africa, S. Europe; cultivated.

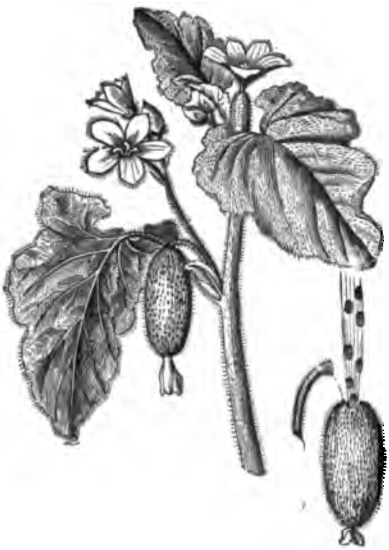
Syn. Squirting or Wild Cucumber, Wild Balsam Apple. Fr. Elatérine, Elatine. Ger. Elaterin.

Ec-bal′li-um. L. fr. Gr. ἐκ, out, + βάλλειν, to throw; *i. e.*, the fruit expelling its contents when fully ripe.

El-a-te′ri-um. L. fr. Gr. ἐλατήριον, driving out, purging; *i. e.*, its medical property. **El-a-te-ri′num; E-lat′er-in**; both are simply derivative names.

PLANT.—Common perennial weed; stem trailing, succulent, bristly, .6–1.3 M. (2–4°) long; leaves cordate, 7.5–12.5 Cm. (3–5′) long, lobed, hispid, pale-green; flowers monœcious, yellow; fruit 5 Cm. (2′) long, 2.5 Cm. (1′) thick, oblong, pale-yellowish-green, beset with fleshy prickles, 3-celled, containing bitter, watery, mucilaginous juice in which are many light-brown seeds. When fruit ripe it becomes yellow, and falls from its attachment to the ground; at the instant of separation, through the socket (peduncle orifice) made by falling from the stem the entire contents are violently expelled, hence called squirting cucumber. This is due to osmosis from pericarp to central pulp, causing engorgement, hence tension and rupture at weakest point. For preparing Elaterium the fruit and stalk should be collected just before ripe, cut lengthwise, lightly pressed (the best without any pressure), juice strained, set aside to deposit, and the sediment put upon porous tiles to dry by gentle heat. Should not be exposed to sun. Forty cucumbers without pressure yield gr. 6 (.4 Gm.), and 40 lbs. (18 Kg.) only yield gr. 240 (15.5 Gm.). Elaterium occurs in grayish fragments or scales, odor tea-like, taste bitter, acrid. Should not effervesce with hydrochloric acid. Dr. Clutterbuck's is considered best.

FIG. 377.



Ecballium Elaterium.

ADULTERATIONS.—Elaterium is often found mixed with starch, calcium carbonate, various minerals colored green. Owing to this adulteration and the irregular treatment in collecting and curing, it becomes a very uncertain product, hence the official Elaterin is much to be preferred, which as a rule is pure.

Constituents.—Elaterin 25–33 p. c., chlorophyll 10 p. c., prophetin, ecballin, hydroelaterin, elaterid.

Elaterinum. Elaterin.—Obtained by exhausting elaterium with chloroform, adding ether, when white crystals at once deposit; wash with ether, recrystallize from chloroform. It is odorless, taste acrid, bitter, soluble in chloroform or hot alcohol, red with warm sulphuric acid. *Test:* Alcoholic solution should not be precipitated by tannic acid T. S., or mercuric chloride T. S., or platinic chloride T. S. (abs. and dif. from alkaloids). Dose, gr. $\frac{1}{20}$–$\frac{1}{10}$ (.003–.006 Gm.).

Preparations.—1. *Trituratio Elaterini.* Trituration of Elaterin. *Manufacture:* 10 p. c. Triturate 10 Gm. with sugar of milk 90. Dose, gr. $\frac{1}{2}$–$\frac{3}{4}$ (.03–.05 Gm.).

Unoff. Preps.: Elaterium. Dose, gr. $\frac{1}{8}$–$\frac{1}{4}$ (.008–.016 Gm.). *Solution of Elaterium,* $\frac{1}{4}$ p. c. in alcohol + $\frac{1}{2}$ p. c. nitric acid. Dose, ♏xxx (2 Cc.).

Properties.—Hydragogue cathartic (most powerful known), producing profuse watery evacuations with griping and much prostration; large doses nauseate, vomit, inflame stomach and bowels, increase flow of urine, and may kill. Does not vomit nor purge dogs, rabbits, but kills them by convulsions. Those working in it often have ulcerated fingers, eyes, etc.

Uses.—The fruit was employed by the ancients, being recommended by Dioscorides in mania, melancholy. Sydenham used it in dropsy, but it fell into disfavor through its severity, until brought forward again by Dr. Ferriar. Useful in dropsy, brain and lung congestion, uræmia, but never in heart diseases.

Poisoning: Evacuate stomach, give demulcents, opium, stimulants.

BRYONIA. BRYONIA (Bryony).

Bryonia {**alba,** *Linné.* / **dioica,** *Linné.*} The root, collected in the spring.

Habitat. C. and S. Europe, in thickets, hedges, etc.

Syn. 1. White Bryony, Wild Hops—Vine or Bryony, Tetter Berry, Wood Vine 2. Red Bryony, Devil's Turnip, Wild Hops—Vine, Wild White Vine, False Mandrake, Hedge Grape, Cow's-lick, Murrain or Snake-berry. Fr. Bryone blanche, Couleuvrée. Ger. Zaunrübe, Gichtrübe.

Bry-o′ni-a. L. fr. Gr. *βρύω,* to grow rapidly; *i. e.*, the stems grow up quickly.

Al′ba. L. *albus,* white; *i. e.*, the yellowish-white flowers and root.

Di-oi′ca. L. fr. Gr. *δι,* two, + *οικος,* a house; *i. e.*, from its being a diœcious plant.

Plant.—Perennial climbing herb, the former monœcious with black berries the size of a pea, the latter diœcious, with red berries (hence names black and red byrony), and by some only considered a variety of *B. alba;* leaves heart-shaped, 5-lobed; flowers small, greenish-yellow or whitish. Root, spindle-shaped, .3–.6 M. (1–2°) long, 5–10 Cm. (2–4′) thick, yellowish-gray; interior white, fleshy, lactescent, odor nauseous, disappearing on drying, taste bitter, acrid. In commerce in thin transverse sections 3 Mm. ($\frac{1}{8}$′) thick, 5 Cm. (2′) broad; bark gray-brown, rough and thin, cambium line brown, medullary rays broad, centre whitish, having many wood-bundles in circles and radiating lines, fracture short; inodorous, bitter; loses upon drying 85 p. c. in weight. *Solvents:* alcohol; hot water not quite as effective. Dose, gr. 10–60 (.6–4 Gm.).

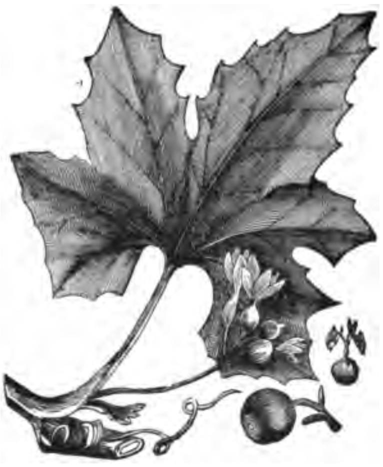
CONSTITUENTS.—Bryonin, $C_{34}H_{48}O_9$, bryoresin, starch, sugar, gum, fatty matter, malates, and other salts.

Bryonin.—A bitter amorphous glucoside, obtained by percolating with alcohol, then diluted alcohol, and finally water; this percolate, either by evaporation or precipitation with tannin, yields bryonin. It is soluble in water, alcohol, insoluble in ether, precipitated by tannin. When boiled with diluted sulphuric acid get glucose, bryoretin and hydrobryoretin. Dose, gr. $\frac{1}{6}$–$\frac{1}{3}$ (.01–.02 Gm.).

PREPARATIONS.—1. *Tinctura Bryoniæ.* Tincture of Bryonia. (Syn., Fr. Teinture de Bryone (blanche); Ger. Zaunrübetinktur.) *Manufacture:* 10 p.c. Macerate, percolate 10 Gm. with alcohol q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

Unoff. Preps.: Infusion. Dose, ℥j–2 (30–60 Cc.). *Fluid Extract.* Dose, ♏x–60 (.6–4 Cc.).

FIG. 378.



Bryonia dioica.

PROPERTIES.—Hydragogue cathartic, emmenagogue, vesicant, emetic (large doses).

USES.— It was popular with Hippocrates and Dioscorides in wine and poultice for tetanus, ulcers, purgative, diuretic. Now generally replaced by jalap, but used as cathartic in dropsy, epilepsy, hysteria, enlarged spleen, bronchitis, whooping-cough, rheumatism, swollen glands, scabies. Large doses poisonous, causing giddiness, delirium, weak pulse, cold perspiration, purging, vomiting, collapse and death. The juice of fresh root is vesicant and cathartic. The berries are an irritant poison.

Allied Plants:

1. *Cayapo'nia america'na* (*Bryonia america'na*).—W. Indies. 2. *Bryonia Kedro'stis na'na* (*africa'na*). S. Africa. Both in their respective countries are used like our official, especially for dropsy. 3. *B. epigæ'a.* India. Used natively as an alterative in syphilis, and as a remedy for snake-bites.

83. CAMPANULACEÆ. Bell-flower Family.

Kam-pan-u-la'se-e. L. *Campanul-a* + aceæ, dim. of *campana*, a bell; *i. e.*, from the resemblance of the corolla. Herbs, shrubs. Distinguished by alternate exstipulate leaves; acrid and usually milky juice;

solitary perfect flowers, calyx 5-lobed, corolla gamopetalous, campanulate or rotate, limb 5-lobed, stamens separate or syngenesious; ovary 2–5-celled, inferior; fruit capsule or berry; temperate climates; emetic, diaphoretic, narcotic.

Genus: 1. **Lobelia.**

LOBELIA. LOBELIA.

Lobelia inflata, *Linné.* } The leaves and tops, collected after a portion of the capsules have become inflated.

Habitat. N. America (Canada, United States), in fields and open places.

Syn. Green, Brown or Bladder-Podded Lobelia, Wild or Indian Tobacco, Emetic Herb or Weed, Asthma or Puke Weed, Eye-bright, Gag Root, Vomit Wort, Low Belia. Fr. (Herbe de) Lobélie enflée. Ger. Herba Lobeliæ, Lobelien-kraut.

Lo-be′li-a. L. after Matthias de Lobel, Flemish botanist, physician and author of several botanical works (1538-1616), native of Lille, became physician and botanist to James I., died in London.

In-fla′ta. L. *inflatus*, inflated, swollen; *i. e.*, seeds are borne in egg-shaped inflated pod.

Plant.—Annual herb; stem .3–.6 M. (1–2°) high, erect, paniculately branched, pubescent, with spreading hairs; root fibrous; leaves alternate, 2.5–7.5 Cm. (1–3′) long, lower petiolate, upper sessile, ovate, dentate, hairy, pale-green; flowers July–Sept., long racemes, small, pale-blue; calyx superior, 5-toothed, adherent, inflated in fruit; corolla bilabiate; stamens 5, united; odor slight, irritating; taste mild, afterward burning, acrid, tobacco-like. Loses upon drying 75 p. c. *Solvents:* diluted alcohol; boiling water. Dose, gr. 1–5 (.06–.3 Gm., expectorant); gr. 10–20 (.6–1.3 Gm., emetic).

Commercial.—Lobelia was popular with our Indians, but was introduced into medicine by Dr. Cutler, of Mass. It should be collected Aug.–Sept., carefully dried and sold loosely, or in various-sized compressed packages; powder keeps well.

Constituents.—Lobeline, Lobelacrin, Lobelic acid, Inflatin, a second alkaloid (?), resin, wax, volatile oil, gum.

Lobeline.—Obtained by evaporating to syrup the acetic-alcoholic tincture (preferably of seeds), triturating this with magnesia in excess, agitating filtrate with ether, evaporating, getting impure alkaloid. It is a yellow, aromatic liquid, acrid taste, convertible into amorphous powder and non-crystalline salts (hydrobromate, sulphate, etc.), soluble in water. Dose (sulphate), gr. $\frac{1}{6}$–1 (.01–.06 Gm.).

Lobelacrin.—Obtained by concentrating tincture in the presence of charcoal, washing with water, exhausting with boiling alcohol; it is the acrid principle—possibly lobelate of lobeline, brown, soluble in ether or chloroform.

Lobelic Acid.—Obtained by precipitating decoction of leaves with copper sulphate, and decomposing with hydrogen sulphide; it is precipitated by copper sulphate, and gives olive-brown with ferric salts.

Inflatin.—Neutral principle (wax) tasteless crystals, no medicinal value.

PREPARATIONS.—1. *Extractum Lobeliæ Fluidum.* Fluid Extract of Lobelia. (Syn., Fr. Extrait liquide de Lobélie enflée; Ger. Flüssiges Lobelienkraut-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏j–5—20 (.06–.3—1.3 Cc.).

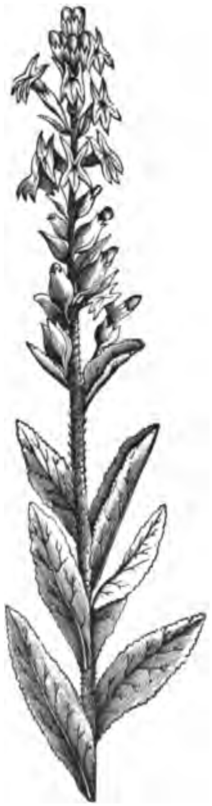
2. *Tinctura Lobeliæ.* Tincture of Lobelia. (Syn., Fr. Teinture de Lobélie enflée; Ger. Lobeliatinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏v–30—60 (.3–2—4 Cc.).

Unoff. Preps.: Extract. Dose, gr. ½–2 (.03–.13 Gm.). *Infusion.* Dose, ℥ss–1 (15–30 Cc.). *Acetum,* 10 p. c. Dose, ♏v–60 (.3–4 Cc.). The "Eclectic" *lobelin,* made in the usual way, is an impure resinoid. Dose, gr. ½–1 (.03–.06 Gm.).

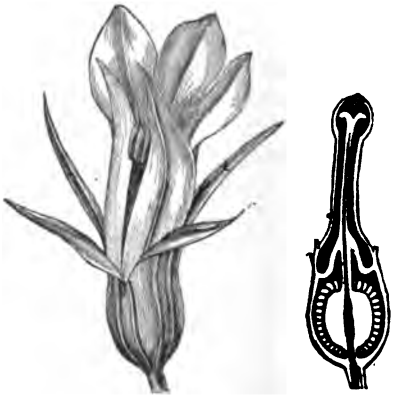
PROPERTIES. — Expectorant, emetic, nervine, purgative, narcotic, diuretic, diaphoretic; similar to ipecac, but causes more distressing nausea and intense prostration. It paralyzes the motor nerves, vasomotor centre and peripheral vagi. Leaves chewed a short while cause giddiness, headache, tremors, nausea, vomiting; full doses give speedy and severe vomiting, general relaxation, cold skin with sweating; if excessive dose have also burning pain in fauces, œsophagus, motor weakness, feeble pulse, low temperature, anxious, livid countenance, contracted pupils, collapse, stupor, coma, death occurring from respiratory failure; resembles tobacco, is dangerous, having caused many deaths.

FIG. 379.



Lobelia inflata.

FIG. 380.



Lobelia flower and section; magnified 5 diam.

USES.—Spasmodic asthma, catarrh, bronchial spasms, whooping-cough, in enema for intussusception, strangulated hernia, constipation; externally for poison-oak eczema. Should not be given as an emetic, and it is too depressing for children.

Poisoning: Tannin, (cardiac and respiratory stimulants), strychnine, picrotoxin, thebaine, alcohol, digitalis, atropine (belladonna), ergot.

Incompatibles: Strychnine, picrotoxin; caustic alkalies decompose lobeline, making preparations inert.

Synergists: Emetics, motor depressants.

Allied Plants:

1. *L. syphili′tica, Great Lobelia.*—Stem .6–1 M. (2–3°) high; flowers large, 2.5 Cm. (1′) long, beautiful blue; diaphoretic. Used by the aborigines for syphilis.

2. *L. cardina′lis, Cardinal-flower.*—Stem .6–1.3 M. (2–4°) high; flowers large, showy, intense cardinal or scarlet-red. Used by Indians as anthelmintic, and like *L. syphilitica*, only milder.

84. CICHORIACEÆ. Chicory Family.

Si-ko-ri-a′se-e. L. *Cichori-um* + aceæ, Gr. *κιχώριον*, *κίχορα*, fr. Egypt. *chikouryeh*, chichory, chicory, succory; *i. e.*, the original Arabic name of the characteristic plant. Herbs. Distinguished by alternate or basal leaves; milky acrid or bitter juice; flowers all alike, perfect, calyx-tube adnate to ovary, corolla gamopetalous, limb 5-toothed, anthers syngenesious; ovary 1-celled; fruit achene; universal; diuretic, tonic, aperient, deobstruent.

Genera: 1. **Taraxacum.** 2. **Lactuca.**

TARAXACUM. TARAXACUM (DANDELION).

Taraxacum Taraxacum, (*Linné*) *Karsten.* } The root, gathered in au-
(**Taraxacum officinale,** *Weber.*) } tumn, July to Oct.

Habitat. Europe (naturalized in N. America, grassy places, roadsides, pastures, fields).

Syn. Lion's Tooth, White (Wild) Endive, Swine Snout, Priest's Crown, Puff Ball; Br. Taraxaci Radix. Fr. Pissenlit Dent de Lion, Couronne de moine. Ger. Radix Taraxaci Cum Herba, Löwenzahn, Pfaffenröhrchen.

Ta-rax′a-cum. L. fr. Gr. *ταράσσω*, *τᾶρακτικός*, to move, disturbing; *i. e.*, its medical properties; name assigned the plant by medieval pharmacists.

Of-fi-ci-na′le. L. see etymology of (*Rheum*) *officinale*, page 168.

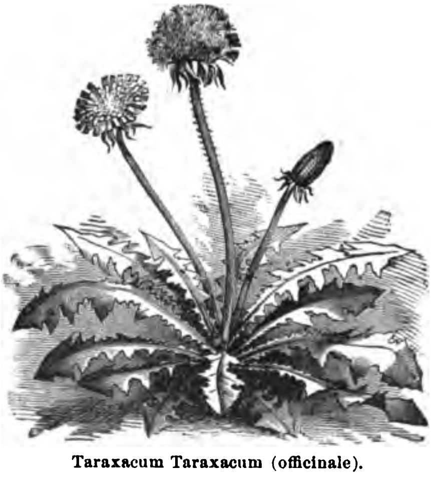
Dan′de-li′on. Fr. L. *dens*, tooth, + *leo*, *leonis*, of the lion; *i. e.*, leaves shape of the lion's tooth (runcinate).

PLANT.—Perennial herb, acaulescent; leaves radical, direct from root-crown, 15–22.5 Cm. (6–9′) long, 5–7.5 Cm. (2–3′) wide, toothed, teeth bent backward, 5–6 on a side, sessile, glabrous, bright-green; flowers terminal upon hollow scapes, 15–20 Cm. (6–8′) high, arising from midst of leaves, golden-yellow, 4 Cm. (1½′) broad, close at night; fruit achene, compressed, oblong-ovate, terminating in silky, hairy, spreading pappus, elevated on a pale-greenish-white stalk, so that when mature the seed attached to this pappus is enabled to be wafted by the wind only to settle down at some distance, and there propagate its kind. ROOT, nearly cylindrical, 10–30 Cm. (4–12′) long, 12–18

Mm. (½–¾′) thick above, crowned with several short, thickish heads, somewhat branched, dark-brown, longitudinally wrinkled, fracture when dry, short, showing yellow, porous central axis, surrounded by thick, white bark, containing many milk-vessels in concentric circles, meditullium without medullary rays, consisting of ducts and elongated cells; inodorous, bitter, should be free from *Cichorium Intybus* root, which closely resembles it, but is usually paler, with milk-vessels in radiating lines. *Solvents:* diluted alcohol; boiling water. Dose, ℥ss–2 (2–8 Gm.).

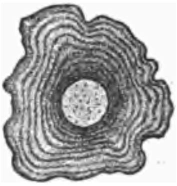
Commercial.—Taraxacum grows alike in dry and damp places, is a universal plant and was known to the Arabians as a blood purifier. The root collected in spring loses in drying 80–85 p. c., if in autumn only 70–75 p. c.; it is sweet after frost and early spring, owing to uncrystallizable sugar 17 p. c., and levulin 18.7 p. c., but these by approaching fall go into, or are replaced by inulin, so that an extract made from the spring collection is sweetish-bitter, and does not become opaque. During spring and summer milk-juice thickens, bitterness increases, and by autumn is generally considered most efficient; that collected June–Aug. might also be as valuable, but is not uniform, hence unreliable; that of Feb.–March gives an extract reliable and clear from its containing so little inulin (1.74 p. c.), and is by some thought the best, whereas that of Oct. is possibly more reliable, but opaque from excessive amount of inulin (24 p. c.). Dried root is often attacked by maggots, consequently should not be kept longer than a year.

FIG. 381.



Taraxacum Taraxacum (officinale).

FIG. 382.



Taraxacum; transverse section of root.

CONSTITUENTS.—Milk-juice (containing taraxacin, taraxacerin, two resins, and glutinous body), inulin 24 p. c., pectin, ash 5–7 p. c.

Taraxacin.—Obtained by treating milk-juice with boiling water, evaporating; it is a crystalline, bitter principle, non-volatile, acrid, soluble in hot water, alcohol, and ether.

Taraxacerin, $C_8H_{16}O$.—Obtained by treating milk-juice with hot alcohol; it is crystallizable, insoluble in water, soluble in alcohol. The old extracts may contain calcium lactate crystals, the lactic acid being produced from inosit, which is present in the leaves and stalks, but not thought to be in the root.

PREPARATIONS.—1. *Extractum Taraxaci.* Extract of Taraxacum. (Syn., Extract of Dandelion ; Fr. Extrait (de Pissenlit) de Dent de Lion ; Ger. Löwenzahn-Extrakt.)

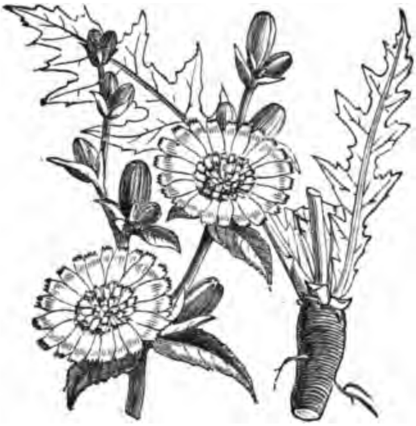
Manufacture: Bruise fresh autumn-root with little water until a paste, express, strain, evaporate. Dose, gr. 5–30 (.3–2 Gm.).

2. *Extractum Taraxaci Fluidum.* Fluid Extract of Taraxacum. (Syn., Br. Extractum Taraxaci Liquidum ; Fr. Extrait liquide de Pissenlit ; Ger. Flüssiges Löwenzahn-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

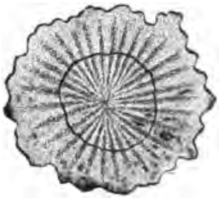
Unoff. Preps.: Decoction, 5 p. c. Dose, ℥j–2 (30–60 Cc.). *Succus.* Dose, ʒij–4 (8–15 Cc.).

FIG. 383.



Cichorium Intybus.

FIG. 384.



Cichorium ; transverse section

PROPERTIES.—Diuretic, tonic, stomachic, aperient, deobstruent.

USES.—Congestion and inflammation of liver and spleen, dyspepsia, constipation, consumption, skin trouble, dropsies, substitute for coffee. Fresh leaves sometimes used as salad.

Allied Plants:

1. *Cicho'rium I'ntybus, Chicory.*—Europe, naturalized in United States. Root with laticiferous vessels radiate, also is whiter, more woody and has thinner bark than taraxacum. July collection contains 36 p. c. of inulin, bitter principle, etc., and has properties similar to the official root with which it is often mixed as an adulterant. Roasted root is frequently used to adulterate coffee. 2. *C. Endi'via, Endive.*—Levant ; cultivated for its bitter leaves.

LACTUCARIUM. LACTUCARIUM.

Lactuca virosa, *Linné.* } The concrete milk-juice.

Habitat. C. and S. Europe, W. Siberia, naturalized in New England. Cultivated.

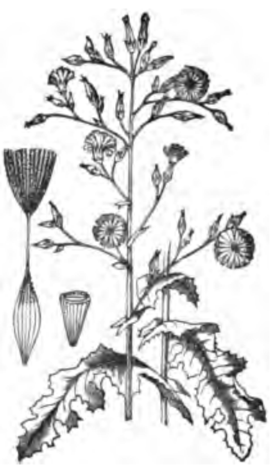
Syn. Acrid Lettuce, Wild Lettuce, German Lactucarium, Strong-scented Lettuce, Prickly Lettuce, Green Endive. Fr. Lactucarium. Ger. Giftlattichsaft.

Lac-tu'ca. L. *lac, lactis,* milk ; *i. e.,* from its milky juice, which exudes when plant is punctured or broken.

Vi-ro′sa. L. *virosus*, poisonous; *i. e.*, its medical properties or odor opium-like.
Lac-tu-ca′ri-um. L. *lactuca*, lettuce, of or belonging to lettuce.

PLANT.—Biennial herb with brown tap-root; stem .6–2 M. (2–6°) high, erect, glabrous, prickly, pale-glaucous-green, often purple-spotted; leaves runcinate—radical .4–.5 M. (16–18′) long, obovate, entire—cauline smaller, few, sessile, spinose apex and margin; base auriculate, pale-glaucous-green, midrib spiny beneath; flowers Aug., pale-yellow, 12–25 Mm. (½–1′) wide, panicles. CONCRETE JUICE (lactucarium), in sections of plano-convex circular cakes or irregular, angular pieces, grayish-brown or dull-reddish-brown, inside whitish or yellowish, waxy lustre; odor heavy, somewhat narcotic; taste bitter. *Tests:* Triturated with water gives turbid mixture; boiled with water softens it, giving a brownish liquid which, when cool, is not colored blue by iodine T. S. (abs. starch), but is clarified by ammonia or alcohol; ammoniacal liquid is precipitated by calcium sulphate (presence of oxalic acid), alcoholic solution is not affected by ferric chloride (abs. tannin); loses in drying 75 p. c. *Solvents:* water dissolves 51 p. c., diluted alcohol 36–44 p. c., spirit of chloroform 55–60 p. c., being mostly lactucerin. Dose, gr. 1–8–15 (.06–.5–1 Gm.).

FIG. 385.



Lactuca virosa.

Commercial. — The plant is cultivated chiefly in Germany, France, Gt. Britain, Austria; it has a disagreeable narcotic odor and a bitter saline taste; all parts abound in a white milky juice, which instantly exudes upon being wounded. We have several varieties of lactucarium:

1. *English.* — In England and Scotland the juice is collected in Aug.–Sept. (when the stalks become thick, succulent, and flower-buds appear), by collectors passing up the rows, cutting off the heads of each stalk and scraping the exuding juice into small tin vessels—two scrapers following one cutter. This process is repeated 6–7 times daily, each cut being made a little lower down the stalk. The juice by night has thickened into a viscid mass, when it is turned out of the vessels, divided into suitable pieces, and dried by gentle heat, requiring about five days—the yield per plant of dry product being 40–50 grs. (2.6–3.3 Gm.). This powders with difficulty, and only emulsifies with acacia.

2. *German.*—Chiefly prepared near Zell, small town on the Moselle. Here the stems, just before flowering, are cut off a foot (.3 M.) below apex, and daily thereafter, from May to Sept., a thin transverse slice is removed. The white exuding juice soon becomes brown, when it is scraped from the scarified top with the finger and put into earthen pots, where it soon hardens, only to be afterwards turned out on frames and dried in the air. It occurs on the market in angular lumps.

3. *French* (*Aubergier's*).—This seldom reaches our market; it was originally cultivated and used by Aubergier himself, being the milky juice of *Lactuca sagitta'ta* (*alti'ssima*), collected in glass vessels, from transverse incisions made daily above downward. Upon coagulation it is shaped into circular cakes 4 Cm. (1½′) thick, and dried on sieves. *Thridace* or commercial French lactucarium is the inspissated expressed juice from the lettuce stalks just before flowering.

CONSTITUENTS.—Lactucin, Lactucic acid, Lactucerin (lactucon) 50–60 p. c., lactucopicrin, (caoutchouc, resin, sugar, oxalic, citric and malic acids, mucilage, asparagin, volatile oil, ash 7–10 p. c.).

Lactucin, $C_{11}H_{12}O_3H_2O$.—This gives the bitter taste, soluble in hot water, alcohol, 60 parts cold water, insoluble in ether, turns red and brown by alkalies, losing its bitterness, and by oxidation produces lactucopicrin. Dose, gr. 1–4 (.06–.26 Gm.).

Lactucic Acid and Lactucopicrin.—These are in the mother-liquor of lactucin, the former being crystalline, bitter, red with alkalies; the latter amorphous, bitter.

Lactucerin, $C_{16}H_{26}O$.—Obtained from lactucarium with boiling alcohol and recrystallizing: forms thin, colorless, tasteless, odorless needles and is claimed to be the acetates of alpha- and beta-lactucerol.

PREPARATIONS.—1. *Tinctura Lactucarii.* Tincture of Lactucarium. (Syn., Fr. Teinture de Lactucarium; Ger. Lactucariumtinktur.)

Manufacture: 50 p. c. Beat lactucarium 50 Gm. to coarse powder with sand, add this to benzin 350 Cc. (to remove inert resinous lactucerin and caoutchouc), percolate powdered residue with glycerin 25 Cc., water 20, alcohol 50, then diluted alcohol q. s. to exhaust, evaporate to 100 Cc. Dose, ʒss–1 (2–4 Cc.).

> Prep.: 1. *Syrupus Lactucarii.* Syrup of Lactucarium. (Syn., Fr. Sirop de Lactucarium; Ger. Lactucariumsirup.)
>
> *Manufacture:* Triturate precipitated calcium phosphate 5 Gm., sugar 15, with tincture of lactucarium 10 Cc., add water 30, to filtrate add sugar 60, and water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ♏j–30 (.06–2 Cc.). *Lozenges.*

PROPERTIES.—Anodyne, sedative, hypnotic, diuretic, expectorant, very unreliable, milder than opium, and unlike it, does not derange the digestive organs.

USES.—Where opium is objectionable, to procure sleep, allay cough, dropsy, palpitation of heart, intermittent fevers, nervousness.

Allied Plants:

1. *L. canade'nsis* (*elonga'ta*), *Wild Lettuce.*—The herb official, 1820–1850. N. America. Herb 1.3–3 M. (4–9°) high, hollow, purple, very leafy, smooth, glaucous; leaves 15–30 Cm. (6–12′) long, pinnatifid; flowers yellow to purple, heads 20-flowered, panicles, rich damp soil, fields, thickets. Juice from the plant, when in flower, makes good Lactucarium; that collected in early season is not bitter.

2. *L. sati'va, Garden Lettuce.*—Juice is medicinal and more abundant in wild than in cultivated plants. Important as salad, and as such

acts as a feeble hypnotic. *L. sagitta'ta* (*alti'ssima*)*;* large Caucasian plant 2.5–3 M. (8–10°) high, chiefly cultivated in France.

85. COMPOSITÆ. Composite (Thistle) Family.

Kom-poz'i-te. L. *Composit-us* + æ, pp. of *componere*, compounded; *i. e.*, referring to the two kinds of florets (ray and disk) composing each flower-head. Herbs, shrubs. Distinguished by being the largest family, by possessing bitter principles, watery or resinous (rarely milky) sap; flowers (florets) 5's, in compound heads surrounded by involucre; calyx superior, tube adnate to ovary, limb often pappose or membranous; corolla epigynous, usually 5-lobed, stamens 5, epipetalous, syngenesious; ovary inferior, 1-celled; ovule 1, erect; fruit achene; universal; tonic, laxative, anthelmintic (bitter principle), aromatic, carminative, diaphoretic, stimulant (volatile oil).

Genera: 1. **Eupatorium.** 2. **Grindelia.** 3. **Leptilon (Erigeron).** 4. **Inula.** 5. **Calendula.** 6. **Anthemis.** 7. **Matricaria.** 8. **Anacyclus.** 9. **Tanacetum.** 10. **Artemisia.** 11. **Arnica.** 12. **Arctium.**

EUPATORIUM. EUPATORIUM (THOROUGHWORT).

Eupatorium perfoliatum, *Linné.* } The leaves and flowering tops.

Habitat. N. America (Canada, United States), damp swampy places, meadows, banks.

Syn. Boneset, Wood Boneset, Teasel, Ague-weed, Joe Pye, Fever-wort, Cross-wort, Thorough-stem, or wax, Vegetable Antimony, Sweating Plant, Indian or Wild Sage, Tearal. Fr. Herbe d'Eupatoire perfoliée, Herbe à Fièvre; Herbe parfaite; Ger. Durchwachsdost, Durchwachsener Wasserdost.

Eu-pa-to'ri-um. L. fr. Gr. *εὐ*, well, + *πατήρ*, father; *i. e.*, born of noble father. After Mithridates Eupator, King of Pontus, who discovered one of the species.

Per-fo-li-a'tum. L. *per*, through, +*folium*, a leaf; *i. e.*, stem passes through (lamina or blade of) the leaf; leaves so clasping stem as to appear pierced by it.

Thoroughwort = *thorough*, through, + *wort*, a plant (leaf, root); *i. e.*, stem apparently passing through the leaf.

Boneset; i. e., relieves pains in limbs in influenza, hence sets bones and pains cease.

PLANT.—Hairy perennial; stem erect, .6–1.2 M. (2–4°) high, much branched at summit; leaves opposite, united at base, lanceolate, 10–15 Cm. (4–6′) long, 2.5–5 Cm. (1–2′) wide, tapering, crenately serrate, rugosely veined, rough above, downy and resinous-dotted beneath; flower-heads corymbed, numerous, with oblong involucre of lance-linear scales; flowers July–Sept., 10–15, tubular, white florets with bristly pappus in a single row; odor weak, aromatic; taste astringent, bitter. Should be collected July, loses on drying 75 p. c. *Solvents:* water or alcohol. Dose, ʒss–1 (2–4 Gm.).

CONSTITUENTS.—Eupatorin, Volatile oil, resin, tannin, crystalline wax, gum, sugar, ash 7.5 p. c.

Eupatorin.—Bitter, crystalline glucoside, soluble in water, alcohol, chloroform, ether. The "Eclectic" resinoid *eupatorin* is very different, being the precipitate from throwing alcoholic tincture (evaporated) into water. Wax can be extracted with benzene or ether.

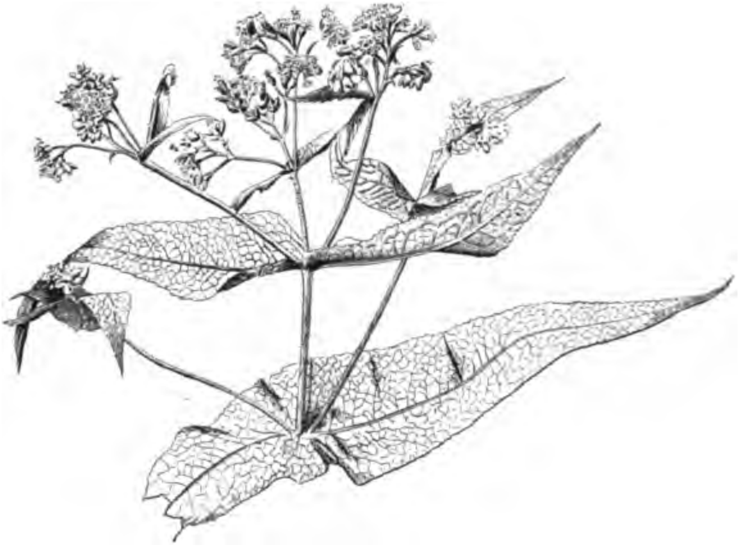
PREPARATIONS.—1. *Extractum Eupatorii Fluidum.* Fluid Extract of Eupatorium. (Syn., Fluid Extract of Boneset; Fr. Extrait liquide d'Eupatoire; Ger. Flüssiges Durchwachsdosten-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Infusion, 5 p. c. Dose, ℥j–2 (30–60 Cc.; when cold—tonic, warm—emetic, diaphoretic). *Decoction,* 5 p. c. Dose, ℥j–4 (30–120 Cc.; purgative). *Extract.* Dose, gr. 5–20 (.3–1.3 Gm.).

PROPERTIES.—Stimulant, tonic, diaphoretic, (diuretic). Large doses emetic, aperient, antiperiodic, similar to chamomile. Was very popular with our Indians, being used in hot tea or infusion until perspiration or vomiting occurred.

FIG. 386.



Eupatorium perfoliatum; flowering top.

USES.—To prevent or break the chill in intermittent fever, muscular rheumatism, break-bone fever, bronchitis, influenza, dyspepsia, sore throat.

Allied Plants:

1. *Eupato'rium purpu'reum, Gravel Root, Queen of the Meadow.*—The root official, 1820–1840. Perennial herb 1–2 M. (3–6°) high, stem green or purplish, purple band at joints, 2.5 Cm. (1′) wide, leaves petiolate, 3–6 in whorl, 20–25 Cm. (8–10′) long, 10–12.5 Cm. (4–5′) wide, downy beneath, flowers purple to white, corymbs, dry woods, meadows; contains euparin; taste bitter, aromatic, astringent.

2. *Eupato'rium verbenæfo'lium (teucrifo'lium), Wild Hoarhound, Rough Boneset.*—The herb official, 1820–1840. Perennial hairy herb .6–2.5 M. (2–8°) high; leaves ovate, oblong, truncate at base, toothed;

flowers Aug., white, panicled corymb, thought by some only a variety of *E. perfoliatum*, low grounds. Both of these have properties similar to official.

3. *E. capillifo'lium* (*fœnicula'ceum*), *Dog-fennel*, *Hog-weed.*—Virginia to Florida. Plant smooth, 1–3 M. (3–10°) high; juice relieves pain from insect-bites.

GRINDELIA. GRINDELIA.

Grindelia { **robusta**, *Nuttall*, **squarrosa**, (*Pursh*) *Dunal.* } The leaves and flowering tops.

Habitat. N. America (west of Rocky Mountains to Texas, Mexico, in salt marshes, along mountain ranges).

Syn. Gum-plant, Broad-leaved Gum-plant. Fr. Grindélia. Ger. Grindelie.

Grin-de'li-a. L. after D. H. Grindel (1776–1836), German botanist, and professor at Riga and Dorpat.

Ro-bus'ta. L. *robustus*, oaken, strong, hardy, fr. *robur*, strength; *i. e.*, the strongest, hardiest variety.

Squar-ro'sa. L. *squarrosus*, scurfy, scaly, full of loose leaves; *i. e.*, the involucre.

Plants.—1. *G. robusta.* Perennial herb, .3–1 M. (1–3°) high, mostly in elevated regions, glabrous; leaves 5 Cm. (2′) long, spatulate, oblong, serrate, scales of involucre produced into long circinate, squarrose, awn-like tips; pappus of several awns, achenes two or three, 1–3-toothed at apex.

2. *G. squarrosa.*—Mostly in the plains, less leafy, woody, and bushy than preceding, .4 M. (16′) high, involucre less leafy, hemispherical, 12 Mm. (½′) broad; leaves more coarsely serrate; flowers many, in heads, subglobular, longer and less broad than preceding, yellow, ray-florets yellow, ligulate, pistillate; disk-florets yellow, tubular, perfect; odor balsamic; taste pungently aromatic, bitter. *Solvent:* alcohol. Dose, gr. 15–60 (1–4 Gm.).

Constituents.—Resin, Bitter principle, Volatile oil, grindeline, (fat, wax, sugar, gum, caoutchouc, tannin, ash 7–8 p. c.).

Resin.—This is the active principle, acrid, so abundant as at times to coat over leaves and involucre, thus making them glutinous, hence the name gum-plant.

Bitter Principle.—This is possibly a glucoside, giving a little virtue.

Volatile Oil.—This has turpentine odor; quantity very small.

Preparations.—1. *Extractum Grindeliæ Fluidum.* Fluid Extract of Grindelia. (Syn., Fr. Extrait liquide de Grindélia; Ger. Flüssiges Grindelien-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol q. s. 100 Cc. Dose, ♏xv–60 (1–4 Cc.).

Unoff. Preps.: Extract. Dose, gr. 5–15 (.3–1 Gm.). *Tincture. Infusion.*

Properties.—Cardiac sedative, expectorant, antispasmodic, tonic, stomachic, diuretic; relaxes muscular coat of the bronchial tubes. Large doses produce narcosis, dilated pupils, impaired power of legs, increases urine. Resembles conium somewhat in action, and cases of poisoning must be treated similarly.

Uses.—Asthma, bronchitis, whooping-cough, catarrh of bladder and uterus. Locally to burns, blisters, rheumatism and poisoning by rhus toxicodendron; in solution or poultice. It is eliminated by the bronchial mucous membrane and the kidneys, stimulating both, the latter, sometimes, even to the extent of renal irritation.

Allied Plants:

1. *G. glutino'sa* and *G. hirsu'tula.*—W. United States, stem of former often purple, tomentose; both are very similar to and often collected and mixed in with the official.

2. *Solida'go odo'ra, Sweet* or *Anise-scented Golden-rod.*—The leaves and tops official, 1820–1880. N. America. Perennial herb, .6–1 M. (2–3°) high, greenish-yellow, pubescent; leaves lanceolate, pellucid-dotted, 2.5–5 Cm. (1–2′) long, 12 Mm. (½′) wide; flowers yellow, racemes; fruit achenes; odor and taste sweet, anise-like, more pronounced when bruised; contains volatile oil. Used for stimulant, rubefacient, anodyne, carminative, diaphoretic, aromatic, for hemorrhages, colic, neuralgia, amenorrhœa, rheumatism; infusion, oil. Dose, ʒss–2 (2–8 Gm.); oil, ♏j–5 (.06–.3 Cc.).

LEPTILON CANADENSE. CANADA FLEABANE.

Oleum Erigerontis. Oil of Erigeron (Oil of Fleabane), *official.*

Leptilon canadense, (*Linné*) *Britton.*
(**Erigeron canadensis,** *Linné.*) } A volatile oil, distilled from the fresh flowering herb.

Habitat. N. America, in fields, waste places; naturalized in other countries.

Syn. Canada Erigeron, Butter, Pride, Horse, Bitter or Fire Weed, Mare's, Colt's, Cow's or Horse Tail, Scabious, Blood-staunch. Fr. Herbe d'Erigeron, Herbe de Vergerette. Ger. Berufkraut, Oleum Erigerontis Canadensis, Oil of Canada Fleabane.

Lep'til-on. L. fr. Gr. *λεπταλέος—λεπτός*, fine, small, delicate; *i. e.*, from the small heads.

Can-a-den'se. L. *canadensis*, Canadian, its original habitat.

E-rig'e-ron. L. fr. Gr. *ἤρι*, early, + *γέρων*, old, an old man, suggested by hoariness of some vernal species, equiv. to *senecio*, groundsel, lit., early old. *Fleabane—flea + bane* = death to fleas; *i. e.*, supposed to drive them away.

Plant.—Annual herb, .3–2.5 M. (1–8°) high, abounding in neglected fields, having all parts medicinal; stem branching, hairy, furrowed; leaves linear-lanceolate, entire or dentate; flowers July–Oct., small, numerous, white, in terminal panicles.

Constituents.—Volatile oil 1 p. c., bitter principle, tannin.

Oleum Erigerontis. Oil of Erigeron.—Obtained by distilling with water or steam; it is a pale-yellow liquid, darker and thicker with age and exposure; odor peculiar, aromatic, persistent; taste aromatic, pungent, sp. gr. 0.850. Contains dextrogyrate limonene, $C_{10}H_{16}$, + a substance easily decomposed or polymerized by heat, hence it is distilled with difficulty under ordinary pressure. *Test:* Soluble in equal volume alcohol (distinction from oil of fireweed—*Erechti'tes hieracifo'lia*, and oil of turpentine), also in equal volume glacial acetic acid which solution with bromine yields crystals of $C_{10}H_{16}Br_4$. Dose, ♏v–10 (.3–.6 Cc.).

Properties.—Stimulant, tonic, diuretic, diaphoretic, styptic.

Uses.—Was first noticed by "Eclectics," who used it for diarrhœa, dysentery, gravel, dropsy, hemorrhages of uterus and bowels. Acts like oil of turpentine, but less irritant and stimulating.

Leaves and *tops*, official, 1820–1880.

Allied Plants:

1. *Eri′geron a′nnuus (heterophyl′lus), Various-leaved Fleabane, Sweet Scabious.*—The herb official, 1830–1880. Biennial herb, 1–1.5 M. (3–5°) high, branched, hairy, leaves sharply, coarsely toothed; flowers Aug., corymbs, rays white tinged with purple, disk yellow; in fields, waste places.

2. *Eri′geron philadel′phicus, Philadelphia Fleabane.*—The herb official, 1820–1880. Perennial herb, .3–1 M. (1–3°) high, pubescent, slender, leafy; leaves 5–10 Cm. (2–4′) long, 12–18 Mm. (½–¾′) wide, broad midrib, flowers June–Aug., numerous, panicled corymbs, rays 150–200, filiform purplish, disk yellow. Both have same constituents and properties as *Leptilon canadense.*

3. *Gnapha′lium obtusifo′lium (polyce′phalum), Common, Sweet* or *Fragrant Life Everlasting.*—Annual erect herb, .3–1 M. (1–3°) high, woolly, fragrant; leaves lanceolate, undulate, sessile, flowers in heads, clustered at summit of corymbose branches, obovate, whitish involucre, yellow, tubular, odor pleasant, bitter. Contains volatile oil and bitter principle; used for diarrhœa, hemorrhages, externally in fomentation and as a vulnerary to bruises, ulcers, etc. Dose, ʒss–1 (2–4 Gm.).

INULA. INULA (ELECAMPANE).

Inula Helenium, *Linné.* } The root.

Habitat. C. and S. Europe, C. Asia, S. Siberia, spontaneous in United States (New Eng. to N. Ca., west to Ill.), along roads, pastures, gardens, meadows; cultivated.

Syn. Allicampane, Alicompane, Aligopane, Scabwort, Horse Elder or Heal, Yellow Starwort, Elfdock, Wild Sunflower, Radix Helenii—Inulæ or Enulæ. Fr. Aunée officinale, Grande Aunée. Ger. Alantwurzel, Helenenwurzel.

In′u-la. L. contr. of Helenium, corrupt form of Gr. *ἑλένιον*, Helen, classic name, the medieval writers spelling it Enula.

Hel-en′i-um. L. fr. above Gr. classic name 'Ελένη, Helen, wife of Menelaus, from whose tears the plant was supposed to have sprung.

Elecampa′ne. Corrupt form of Anti-Linnean name *Enula Campana*, bellwort.

Plant.—Perennial herb; stem 1–2 M. (3–6°) high, thick, solid, striate, villous, branched near top; leaves large, .3–.5 M. (10–18′) long, 10–20 Cm. (4–8′) wide, ovate, serrate, veins reticulate, rough and deep-green above, densely pubescent beneath, long-petioled, with fleshy midrib; flowers July–Aug., large, 6 Cm. (2½′) wide, single, golden-yellow. Root, 15–30 Cm. (6–12′) long, 18–25 Mm. (¾–1′) thick; in commerce usually as transverse, concave slices or longitudinal sections, with overlapping bark, wrinkled, brown, flexible in damp weather, when dry, fracture short, inside grayish-white, fleshy, slightly radiate, dotted with many shining yellowish-brown resin-cells, free from starch; odor peculiar, aromatic; taste bitter, pungent. Should be dug in autumn of the second year. *Solvents:* alcohol; water partially. Dose, ʒss–1 (2–4 Gm.).

CONSTITUENTS.—Volatile oil, acrid resin, bitter principle, inulin, helenin, wax.

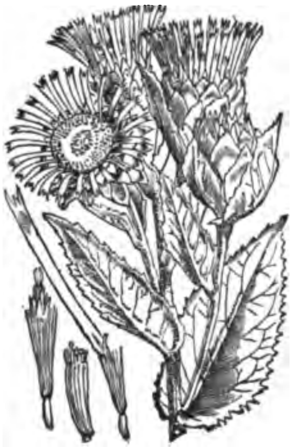
Volatile Oil.—Contains sesquiterpene, inulol (alantol), $C_{10}H_{16}O$, yellowish liquid of peppermint-odor and aromatic taste; but chiefly inulic (alantic) anhydrid (alanto-lactone or helenin), in needles, camphor-like.

Helenin (*elecampane camphor, alanto-lactone*), $C_{15}H_{20}O_2$.—This has been separated into helenin crystals, C_6H_8O, insipid, and alant camphor, peppermint-odor and taste. Antiseptic, expectorant, antispasmodic. Dose, gr. $\frac{1}{6}$–$\frac{1}{3}$ (.01–.02 Gm.).

Inulin.—Like starch, only yellow with iodine, has no concentric formation, and does not gelatinize. Of this the autumn-collected root yields 44 p. c., the spring collection 19 p. c.

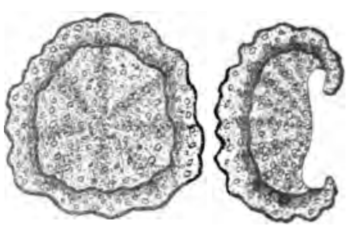
PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ʒss–1 (2–4 Cc.). *Decoction.* Dose, ℥j–2 (30–60 Cc.). *Infusion.* Dose, ℥j–2 (30–60 Cc.).

FIG. 387.



Inula Helenium.

FIG. 388.



Inula; transverse section, natural size.

PROPERTIES.—Stimulant, diaphoretic, diuretic, expectorant, emmenagogue, tonic, rubefacient. Large doses nauseate and vomit.

USES.—Very popular with the ancients. Hippocrates extolled it as stimulating brain, stomach, kidneys, uterus; now chiefly used in lung troubles, also for bronchitis, dyspepsia, vesical catarrh, amenorrhœa, skin troubles, dropsy, whooping-cough, diphtheria, to flavor absinthe.

Allied Plants:

1. *I. squarro'sa.*—S. Europe. Leaves tomentose, rugose, ray-florets 3-cleft, tubular; emmenagogue, diuretic, powder burned to destroy insects.
2. *Pulica'ria* (*Inula*) *dysente'rica, Fleawort;* used like the preceding.

Carli'na acau'lis.—Europe. Contains volatile oil, resin, similar to official in odor, etc.; diaphoretic, diuretic, large doses purgative, typhoid condition, impotence, amenorrhœa, tongue paralysis. Dose, gr. 10–20 (.6–1.3 Gm.).

RECAPITULATION No. 10.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
1. Digitalis. 2. Digitalis (Foxglove).	Digitalis purpurea.	The leaves.	S. and C. Europe.	Digitalin, digitoflavon, resin, digitalosmin, digitoleic acid, inosit, pectin.	Extr., fld. extr., infusion, tinct.	Sedative, narcotic, diuretic, cardiac, tonic, vascular stimulant, emetic.	Feeble heart, renal trouble, dropsy, pneumonia, mania, delirium, menorrhagia, epilepsy, enlarged glands.	1–2 (.06–.13 Gm.)
Pedaliaceæ:								
1. Oleum Sesami. 2. Oil of Sesamum (Sesame-, Teel-, Benne Oil).	Sesamum indicum.	The fixed oil.	India, N. and S. America.	Olein, myristin, palmitin, stearin, resinoid compound.	....	Laxative.	Like olive oil.	Minims. 240–960 (15–60 Cc.)
Rubiaceæ:								
1. Caffea. 2. Coffee.	Coffea arabica.	Caffeine (basic proximate principle (alkaloid)).	Trop. Africa.	$C_8H_{10}N_4O_2 + H_2O$.	Citrated caffeine, effervescent citrated caffeine.	Tonic, stimulant, nervine, anti-emetic.	Nervous headache, cholera, diarrhœa, phthisis, dropsies, gout, insomnia, fevers.	Grains. Caffeine. 1–5 (.06–.3 Gm.)
1. Thea. 2. Tea.	Thea sinensis.		S. E. Asia.					
1. Ipecacuanha. 2. Ipecac.	Uragoga (Cephaëlis) Ipecacuanha.	The root.	Brazil, Bolivia, New Granada.	Emetine, cephaëline, ipecacuanhic acid, resin.	Fld. extr., syr., wine, troches, tr. ip. et opii, pulv. ip. et opii, troch. morph. et ip.	Emetic, expectorant, diaphoretic, cholagogue, hæmostatic.	Catarrh, spasmodic croup, asthma, pneumonia, dyspepsia, pregnant vomit, cholera, ophthalmia.	1–20 (.06–1.3 Gm.)
1. Cinchona. 2. Cinchona.	Cinchona: Calisaya, officinalis.	The bark.	S. America, (Java, India, Ceylon).	Quinine, quinidine, cinchonine, cinchonidine, quinamine, chinoidine, quinic, quinovic, and cinchotannic acids, cinchona-red, volatile oil.	Extract, fld. extr., infusion, tinct. Tinct. cinch. comp., alkaloids from either, *Quinine:* ferri et quin. cit., syr. ferri quin. strych. phos.	Tonic, antispasmodic, febrifuge, astringent.	Dyspepsia, convalescence, gastric catarrh, asthma, bronchitis, intermittents, typhoid pneumonia, neuralgia, erysipelas.	15–60 (1–4 Gm.)
1. Cinchona Rubra. 2. Red Cinchona.	Cinchona succirubra.							
Caprifoliaceæ:								
1. Sambucus. 2. Sambucus (Elder).	Sambucus canadensis.	The flowers.	N. America.	Volatile oil, fat, resin, tannin, mucilage.	....	Stimulant, carminative, diaphoretic, sudorific, laxative.	Rheumatism, erysipelas, eye troubles, ulcers, syphilis, dropsy, epilepsy.	30–60 (2–4 Gm.)
1. Viburnum Opulus. 2. Viburnum Opulus (Cramp Bark).	Viburnum Opulus.	The bark of the stem.	United States.	Valerianic acid, resin, viburnin, tannin, oxalates, citrates, malates.	Fluid extract.	Diuretic, tonic, antispasmodic, nervine, astringent.	Dysmenorrhœa, menorrhagia, asthma, hysteria.	30–120 (2–8 Gm.)
1. Viburnum Prunifolium. 2. Black Haw.	Viburnum prunifolium.				Fluid extract.			30–120 (2–8 Gm.)

Valerianaceæ:								
1. Valeriana. 2. Valerian.	Valeriana officinalis.	The rhizome and roots.	Europe, N. Asia.	Volatile oil, valerianic, formic, acetic, malic acids, chatinine, tannin, resin.	Fluid extract, tincture, ammoniated tincture of valerian.	Stimulant, anodyne, nervine, antispasmodic, vermifuge.	Hysteria, nervous coughs, diabetes, delirium tremens, typhoid, dysmenorrhœa, epilepsy, flatulence.	15–60 (1–4 Gm.)
Cucurbitaceæ:								
1. Pepo. 2. Pumpkin Seed.	Cucurbita Pepo.	The seed.	Tropic Asia, America.	Fixed oil, acrid resin, starch, proteids.	....	Tænifuge, vermifuge.	Tape and lumbricoid worms.	480–960 (30–60 Gm.)
1. Colocynthis. 2. Colocynth.	Citrullus Colocynthis.	The fruit deprived of its rind.	Asia, Africa, S. Europe.	Colocynthin, colocynthitin, pectin, gum.	Extr., comp. extr., pil. cathar. co., pil. cathar. veg.	Cathartic, drastic, diuretic, emetic.	Evacuant, dropsy, apoplexy, paralysis.	2–10 (.13–.6 Gm.)
1. Elaterinum. 2. Elaterin.	Ecballium Elaterium.	The neutral principle from Elaterium.	W. Asia. N. Africa, S. Europe.	$C_{20}H_{28}O_5$.	Triturate.	Hydragogue cathartic.	Dropsy, brain and lung congestion, uræmia.	1/20–1/10 (.003–.006 Gm.)
1. Bryonia. 2. Bryonia (Bryony).	Byronia {alba, dioica.	The root.	C. and S. Europe.	Bryonin, starch, sugar, gum.	Tincture.	Cathartic, emmenagogue, vesicant, emetic.	Dropsy, epilepsy, bronchitis, rheumatism, swollen glands, scabies.	10–60 (.6–4 Gm.)
Campanulaceæ:								
1. Lobelia. 2. Lobelia.	Lobelia inflata.	The leaves and tops.	N. America.	Lobeline, inflatin, lobelacrin, lobelic acid, resin, volatile oil.	Fluid extract, tincture.	Expectorant, emetic, nervine, purgative, narcotic.	Spasmodic asthma, catarrh, bronchial spasms, whooping-cough.	1–20 (.06–1.3 Gm.)
Cichoriaceæ:								
1. Taraxacum. 2. Taraxacum (Dandelion).	Taraxacum Taraxacum (officinale).	The root.	Europe.	Inulin, pectin, milk-juice, taraxacin, resin, taraxacerin.	Extract, fld. extr.	Diuretic, tonic, aperient, deobstruent.	Liver complaint, dyspepsia, constipation, eczema, dropsies.	30–120 (2–8 Gm.)
1. Lactucarium. 2. Lactucarium.	Lactuca virosa.	The concrete milky juice.	C. and S. Europe.	Lactucin, lactucic acid, lactuco-picrin, lactucerin, volatile oil, asparagin, caoutchouc.	Tincture, syrup.	Anodyne, sedative, hypnotic, expectorant.	Insomnia, cough, dropsy, heart-trouble, nervousness, intermittents.	1-8-15 (.06-.5-1 Gm.)
Compositæ:								
1. Eupatorium. 2. Eupatorium (Thoroughwort).	Eupatorium perfoliatum.	The leaves and flowering tops.	N. America.	Eupatorin, volatile oil, resin, tannin.	Fluid extract.	Stimulant, tonic, diaphoretic.	Intermittents, muscular rheumatism, bronchitis, dyspepsia.	30–60 (2–4 Gm.)
1. Grindelia. 2. Grindelia.	Grindelia: robusta, squarrosa.	The leaves and flowering tops.	N. America.	Volatile oil, resin, bitter principle, grindeline, fat.	Fluid extract.	Sedative, tonic, antispasmodic.	Asthma, bronchitis, catarrhs, whooping-cough, rheumatism, burns, blisters.	15–60 (1–4 Gm.)
1. Oleum Erigerontis. 2. Oil of Erigeron (Oil of Fleabane).	Leptilon (Erigeron) canadense.	Volatile oil from the flowering herb.	N. America.	Limonene, $C_{10}H_{16}$ + oxygenated compound.	....	Stimulant, tonic, diuretic, styptic.	Diarrhœa, hemorrhages, gravel, dropsy.	Minims. 5–10 (.3–.6 Cc.)
1. Inula. 2. Inula (Elecampane).	Inula Helenium.	The root.	C. and S. Europe, C. Asia.	Volatile oil, resin, bitter principle, inulin, helenin.	....	Stimulant, diaphoretic, diuretic, expectorant, emmenagogue, rubefacient.	Bronchitis, dyspepsia, catarrhs, amenorrhœa, dropsy, eczema, whooping-cough, diphtheria.	Grains. 30–60 (2–4 Gm.)

CALENDULA. CALENDULA (MARIGOLD).

Calendula officinalis, *Linné.* } The florets.

Habitat. S. Europe, Levant. Cultivated universally in gardens for ornament.

Syn. Garden or Pot Marigold, Mary Bud, Gold-bloom, Holigold, Jackanapes-on-horseback. Fr. Souci, Fleurs de Tous les Mois. Ger. Ringelblume, Todtenblume.

Ca-len′du-la. L. deriv. fr. *calendæ*, calends, the first day of the month; *i. e.*, it produces flowers almost every month in the year.

Of-fi-ci-na′lis. L. see etymology of (*Asagræa*) *officinalis*, page 95.

PLANT.—Annual herb; stem .3–.6 M. (1–2°) high, angular, roughish-hairy; leaves toothed, spatulate, oblanceolate; flower-heads terminal, 5 Cm. (2′) broad, involucre flattish, hemispherical, two-rowed; ray-florets, one or several rows, disk-florets, many, tubular, 5-cleft, yellow, much diminished by drying. RAY-FLORETS (calendula), 12 Mm. (½′) long, 6 Mm. (¼′) wide, linear, strap-shaped, delicately veined longitudinally, 3-toothed, orange-yellow, becoming whitish by sunlight; odor slight, heavy; taste bitter, saline. *Solvents:* alcohol; boiling water partially. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—*C. arve′nsis*, often cultivated; smaller, more spreading, flowers light-yellow, achenes nearly straight. *Tage′tes ere′cta* and *T. pa′tula*. Mexico, Tropic America; cultivated as French or African Marigold. Flowers substituted for official, but have tubular involucre (owing to the scales uniting), and often reddish florets.

CONSTITUENTS.—Volatile oil, bitter principle (amorphous), calendulin (gummy, analogous to bassorin, yellow, tasteless, soluble in alcohol, insoluble in ether, swells into a jelly with water), fat, resin, sugar, gum.

PREPARATIONS.—1. *Tinctura Calendulæ.* Tincture of Calendula. (Syn., Tincture of Marigold; Fr. Teinture de (Souci) Fleurs de Tous les Mois; Ger. Ringelblumetinktur, Calendulatinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Decoction. Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 2–10 (.13–.6 Gm.). *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.).

PROPERTIES.—Stimulant, tonic, febrifuge, anthelmintic, resolvent.

USES.—Formerly in jaundice, amenorrhœa, scrofula, low fevers, vomiting. Both internally and externally in cancer, ulcers, wounds, otitis. The tincture mostly as an embrocation in sprains, bruises, etc., instead of tincture of arnica or myrrh; the powder in chafing. This is a great remedy in "homœopathic surgery."

ANTHEMIS. ANTHEMIS (CHAMOMILE).

Anthemis nobilis, *Linné.* } The flower-heads, collected from cultivated plants.

Habitat. S. and W. Europe, gravelly roadsides (cultivated in Germany, Gt. Britain (Mitcham's drug farms), France, Belgium; naturalized somewhat in United States).

Syn. Roman, Garden, English, Scotch, White or Low Chamomile, Ground Apple, Whig Plant, Camomile. Fr. Camomille Romaine; Ger. Römische Kamille.

An′the-mis. L. fr. Gr. *ἀνθεμίς—ἀνθος*, a flower; *i. e.*, from its numerous flowers.

No′bil-is. L. famous, noble; *i. e.*, from the appreciation of its handsome yellow flowers.

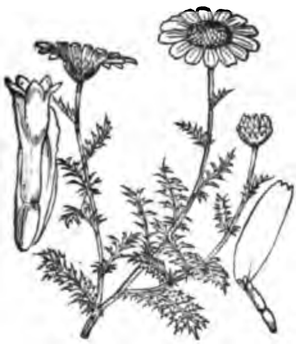
COMPOSITÆ.

PLANT.—This has also been named *Chamomi'lla nobilis*, and is a trailing perennial ; stem 15–30 Cm. (6–12′) long, hairy ; leaves bi- or tripinnatisect, hairy. FLOWERS, June–Sept., 18 Mm. (¾′) broad, subglobular, consisting of imbricated involucre, and many white 3-toothed ray- and yellow disk-florets, receptacle chaffy, conical, convex, solid ; odor agreeable ; taste aromatic, bitter. *Solvents :* alcohol ; hot water. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—Flowers of *Anthemis arve'nsis*, *Anthemis* (*Maru'ta*) *Co'tula*, *Matrica'ria Chamomilla*, *Chrysa'nthemum* (*Pyre'thrum*) *Parthe'nium*, and *Achille'a Pta'rmica*. All these are smaller than official ; the first three being wild-grown, have single whorls of ray-florets. *Chrysanthemum* receptacle is naked, convex. *Achillea* rays are round, short, inodorous, acrid.

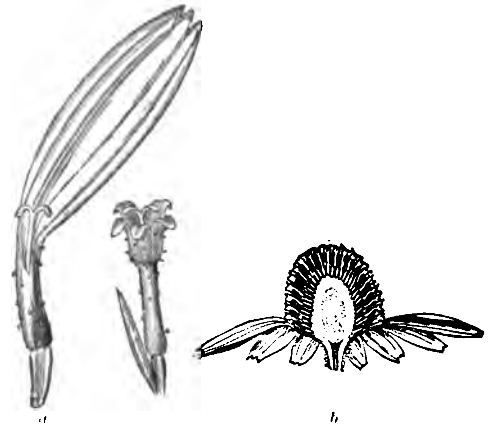
Commercial.—The wild-grown flowers have only one whorl of ray-florets, hence called single ; the cultivated flowers have yellow disk-florets more or less converted into white ray-florets, giving us commercially the double, which, being larger, are preferred, although the unaltered disk contains most aroma and possibly more bitter principle ; to retain color and activity, must be dried quickly.

FIG. 389.



Anthemis nobilis, wild.

FIG. 390.



Anthemis ; *a*, ray- and disk-floret, magnified 4 diam. ; *b*, section through single flower head, natural size.

CONSTITUENTS.—Volatile oil 1 p. c., anthemic acid (bitter principle), anthemene (anthemidin), $C_{18}H_{36}$, resin 5 p. c., tannin, fixed oil.

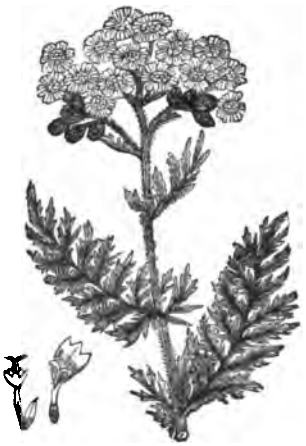
Volatile Oil (Oleum Anthemidis).—This is a bluish-green to yellowish liquid, acid, sp. gr. 0.910. Contains anthemol, $C_{10}H_{16}O$, + isobutyl esters of isobutyric and angelic acids, amyl esters of tiglic and angelic acids, the hexyl esters of tiglic and angelic acids. Dose, ♏j–5 (.06–.3 Cc.), on sugar.

Anthemic Acid.—Obtained by exhausting flowers with hot acidulated (acetic) water, concentrating, precipitating with alcohol, evaporating filtrate, treating with chloroform, the alcoholic precipitate contains anthemene or anthemidin; colorless, silky needles ; agreeable chamomile-odor; strong, bitter taste, soluble in water, alcohol, chloroform, ether; anthemidin occurs in tasteless crystals, insoluble in alcohol, ether, chloroform, soluble in acetic acid.

Preparations.—(Unoff.) *Fluid Extract.* Dose, ʒss–1 (2–4 Cc.). *Infusion* (best form). Dose, ℥j–2 (30–60 Cc.). *Extract.* Dose, gr. 3–10 (.2–.6 Gm.). *Poultice.*

Properties.—Stimulant (volatile oil), tonic (anthemic acid), carminative, nervine, emmenagogue. Warm infusion an emetic; cold infusion a tonic; oil is also antispasmodic. Large doses cause vomiting, diarrhœa, pain and fulness in head, drowsy intoxication.

Fig. 391.



Achillea Millefolium.

Uses.—Weak digestion, general debility, intermittents, torpid liver, delirium tremens, as a masticatory in dyspepsia. Externally for colic, toothache, earache, ulcers, sprains; in poultice with vinegar, laudanum, etc. Oil used locally for rheumatism, flatulent colic.

Allied Plants:

1. *A'nthemis* (*Maru'ta*) *Co'tula, Mayweed.*—The herb official, 1820–1880. N. America. Annual plant in fields, roadsides, .3–.6 M. (1–2°) high, greenish, furrowed; leaves thrice pinnatifid; flowers June–Sept., receptacle solid, conical, chaffy, ray-florets white, disk yellow. Contains volatile oil, valerianic acid, fat, tannin, anthemidine (?), anthemic acid. Used as stimulant, antispasmodic, sudorific, emmenagogue, vesicant for hysteria, colic, dysmenorrhœa; in infusion. Dose, ʒss–2 (2–8 Gm.).

2. *Achille'a Millefo'lium, Yarrow, Milfoil.*—The leaves and flowering tops official, 1860–1880. N. America. Perennial herb, .3–.6 M. (1–2°) high, hairy; leaves lanceolate, glandular beneath, 5–25 Cm. (2–10′) long, twice pinnatifid, segments toothed; flowers Aug., corymbs, receptacle flat, chaffy, ray-florets white, pistillate; disk white, perfect; fruit achenes, chamomile-odor, taste bitter, aromatic. Contains volatile oil, achilleine, resin, tannin. Used as stimulant, tonic, emmenagogue for amenorrhœa, menorrhagia, piles, leucorrhœa, colic, relaxed throat, sore nipples, intermittents; infusion, expressed juice. Dose, ʒss–1 (2–4 Gm.); oil, ♏v–15 (.3–1 Cc.).

MATRICARIA. MATRICARIA (German Chamomile).

Matricaria Chamomilla, *Linné.* } The flower-heads.

Habitat. Europe, W. Asia (naturalized in Australia, cultivated in German settlements in United States).

Syn. Wild Chamomile, Horse-gowan. Fr. Fleurs de Chamomille commune (d'Allemagne). Ger. Flores Chamomillæ (Vulgaris), Kamillen, Kamillenblumen.

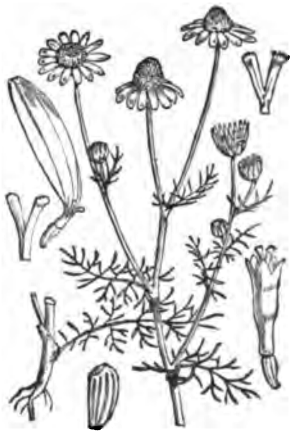
COMPOSITÆ.

Mat-ri-ca′ri-a. L. fr. *matrix, matrice,* the womb; *i. e.,* its supposed effect on that organ; name used by the medieval pharmacists.

Cham-o-mil′la, better *Camomilla.* L. fr. Gr. *χαμαί,* on the earth, + *μῆλον,* an apple, lit., "earth apple"; *i. e.,* from odor of the bruised plant and flowers. (Dioscorides.)

Plant.—Annual herb; stem .3–.6 M. (1–2°) high, branched, smooth, solid, striate, pale-green; leaves 5 Cm. (2′) long, lower tripinnate, upper bipinnate, green, smooth; leaflets linear, small; Flowers, May–Aug., 12–18 Mm. (½–¾′) broad, composed of flattish imbricate involucre, conical, hollow, naked receptacle 5 Mm. (⅕′) high, about 15 white ligulate, reflexed ray-florets, numerous, yellow, tubular, perfect disk-florets, without pappus; strongly aromatic, bitter. *Solvents:* boiling water; alcohol. Dose, gr. 15–60 (1–4 Gm.).

Fig. 392.



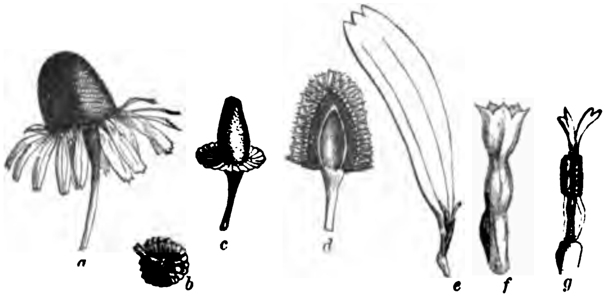
Matricaria Chamomilla.

Adulterations. — *A′nthemis arve′nsis* and *A.* (*Maru′ta*) *Co′tula,* have very similar flower-heads, but their receptacles are conical, solid and chaffy.

Constituents. — Volatile oil ¼ p. c., Anthemic acid, anthemidin, extractive, tannin, malates.

Volatile Oil.—Obtained by distilling entire plant or flowers; dark-blue liquid, due to azulene, sp. gr. 0.940, soluble in alcohol; consists of a paraffin-like body, terpene, $C_{10}H_{16}$, and a colorless oil, anthemol, $C_{10}H_{16}O$. An artificial oil is used in Germany (flowers 480 parts + oil lemon 1 part, distilled with water); it is deep-blue, more limpid, and changes color easier than the pure oil.

Fig. 393.



Matricaria; *a,* flower head; *b,* involucre; *c,* receptacle and involucre; *d,* longitudinal section of receptacle, with disk-florets; *e,* ray-floret; *f,* disk-floret; *g,* stamens and style of disk-floret.

Dose, ♏j–5 (.06–.3 Cc.), on sugar, in pill or ether.

Preparations.—(Unoff.) *Oleum Chamomillæ Infusum* (flowers 10 parts, olive oil 100 parts, digested 2 hours). Used externally. *Syrup* (flowers 3 parts, water for infusion 10, + sugar 18). *Infusion,* 5 p. c., when cold a tonic, when warm an emetic. Dose, *ad libitum.* *Poultice.*

PROPERTIES.—Stimulant (volatile oil), tonic (anthemic acid), carminative, diaphoretic, nervine, emmenagogue, antispasmodic, anthelmintic, less agreeable than *Anthemis nobilis*, but can be substituted for it.

USES.—Warmth to stomach, to aid digestion in convalescence, general debility, intermittents, delirium tremens, flatulent colic ; externally local pains, intestinal and uterine colic, toothache, earache, abscesses, sprains, rheumatism.

PYRETHRUM. PYRETHRUM (PELLITORY).

Anacyclus Pyrethrum, (*Linné*) *De Candolle.* } The root.

Habitat. N. Africa, Algeria, Barbary, high lands ; cultivated in gardens.

Syn. Pellitory of Spain, Spanish Chamomile, Alexander's-foot, Radix Pyrethri Romani. Fr. Pyrèthre officinal. Salivaire. Ger. Römische Bertramwurzel.

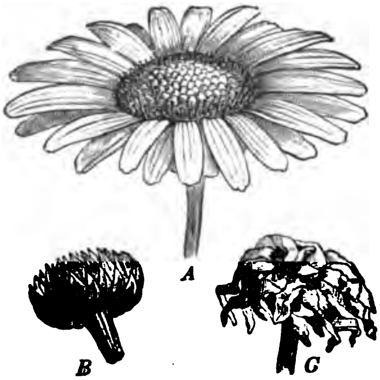
An-a-cy′clus. L. abr. fr. *Ananthocyclus*, old generic name, fr. Gr. ἀ, not, + ἄνθος, a flower, + κύκλος, a circle ; *i. e.*, the outer circlet of ovaries being without flowers.

Py-re′thrum. L. fr. πῦρ (εθρον), fire ; *i. e.*, roots spicy taste, feverfew.

Pel′li-tory. Corrupt. of *parietary*, L. *parietaria*, the wall plant, *paries*, a wall, grows on walls.

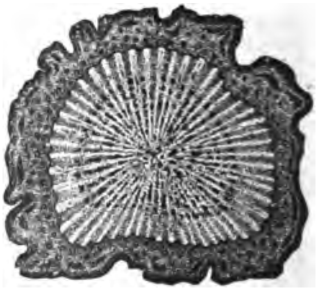
PLANT.—Procumbent perennial, resembling chamomile ; stems numerous, trailing at base, erect in the upper portion, .3 M. (1°) high, terminated by one large flower ; leaves doubly pinnate, segments linear, pale-green, hairy or glabrous ; flowers April–June, terminal heads, 2.5–4 Cm. (1–1½′) wide ; rays white above, reddish-purple below and on edges, disk wide, yellow ; fruit compressed, obovate, achene smooth, with narrow wing and pappus. ROOT, 5–10 Cm. (2–4′) long, 12 Mm. (½′) thick, fusiform, nearly simple, annulate above, wrinkled below, dark-brown, inside brownish-white ; fracture short, bark thick, with 2 circles of resin-cells surrounding the slender yellow wood-bundles and medullary rays, these latter slender, with 4 circles of shining resin-cells ; inodorous, pungent, acrid. *Solvents:* alcohol ; boiling water partially. Dose, ʒss–1 (2–4 Gm.).

FIG. 394.



Anacyclus Pyrethrum ; *A*, expanded flower ; *B*, involucre seen from below ; *C*, dried flower.

FIG. 395.



Pyrethrum ; transverse section, magnified 3 diam.

Commercial.—It has been cultivated sparingly in Europe since 1570; ours come solely from Algeria, via Oran and Algiers, or via Tunis, thence to Leghorn, Egypt, India, etc.; although sometimes called Pellitory of Spain, very little comes from that country.

CONSTITUENTS.—Pyrethrin (pellitorine, resin, + 2 fixed oils), 5 p. c., pyrethrine, inulin 50 p. c., tannin, mucilage.

Pyrethrin.—This is extracted with ether; consists of pellitorine (most active medicinally), acrid brown resin, also an acrid fixed oil, soluble in potassa, and a yellow acrid fixed oil, insoluble in potassa.

PREPARATIONS.—1. *Tinctura Pyrethri.* Tincture of Pyrethrum. (Syn., Tincture of Pellitory; Fr. Teinture de Pyrèthre; Ger. Bertramwurzeltinktur.)

Manufacture: 20 p. c. Macerate, percolate 20 Gm. with alcohol, q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Fluid Extract. Dose, ʒss–1 (2–4 Cc.). *Decoction, Alcoholic Extract, Gargle;* all mostly used externally, *Masticatory.*

PROPERTIES.—Irritant, rubefacient, sialagogue, sternutatory. When chewed have prickling sensation in the tongue and fauces, with heat, acridity, pungency, copious flow of saliva and mucus. Large doses may cause bloody diarrhœa, quick pulse, spasms, stupor; stimulation is due to direct irritation of nerve ends locally, which soon depresses nerves and blunts their sensibility.

USES.—Administered by mastication; headache, rheumatism, neuralgia, toothache, paralysis of tongue or throat, relaxed uvula, chronic catarrh; alcoholic tincture or extract, as an anæsthetic in carious teeth.

Allied Plants:

1. *A. officina'rum, German Pellitory.*—Cultivated in Saxony, Bohemia, Prussia, near Magdeburg, and is thought to be the annual form of the official plant; root 6 Mm. (¼′) thick, smaller than official, bark thick with 1 circle resin-cells, medullary rays without resin-cells.

2. *Chrysa'nthemum (Pyre'thrum) ro'seum* and *C. ca'rneum, Persian Pellitory—Persian (Caucasian) Insect Powder.*—W. Asia, Persia. Perennial plants, resembling chamomile; flower-heads 4 Cm. (1½′) broad; only used for killing insects; ray-florets rose-colored, anthers included (*roseum*), or purple with anthers projecting (*carneum*).

3. *C. cinerariæfo'lium, Dalmatian Insect Powder.*—Dalmatia. These flowers are most valuable when collected right after expansion. They yield an insect-powder much inferior in activity, which depends, in every case, for the insecticidal effect, upon their volatile oil. *Tests:* 1. Put gr. 4 (.25 Gm.) of the powder upon fly in a vial, it should be stupefied in one minute and dead in two or three minutes. 2. With microscope can recognize scarcity of pollen and abundance of collenchymatous tissue when much stem and few flowers are used. Powder often adulterated with other compositous plant flowers as *Chrysanthemum Leuca'nthemum (Leucanthemum vulga're)*, white-weed, oxeye or field daisy, and *C. sege'tum.* Neither of these is an insecticide, but will produce dermatitis in some persons.

TANACETUM. TANSY.

Tanacetum vulgare, *Linné.* } The leaves and tops.

Habitat. Europe, Asia, old fields, roadsides, near river-banks (naturalized in N. America, cultivated in gardens, etc.).

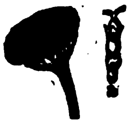
Syn. Common Tansy, Hindheel, Bitter Buttons, Ginger-plant, Parseley or Scented Fern, Summitates Tanaceti. Fr. Tanaisie, Herbe aux Vers. Ger. Rainfarn, Wurmkraut.

Tan-a-ce′tum. L. altered fr. Gr. *a*, not, + *θάνατος*, death—deathless, immortality; *i. e.*, its durable flowers.

Vul-ga′re. L. *vulgaris*, common; *i. e.*, that growing wild, in general use, not cultivated.

PLANT.—Perennial herb, .6–1 M. (2–3°) high; stem strong, obscurely hexagonal, striated, branched near summit, often reddish; root stout, fibrous, many-headed; flowers Aug., yellow, discoid, dense, terminal corymbs; fruit achene, small, oblong, 5–6 ribs, crowned with membranous pappus. LEAVES, 15 Cm. (6′) long, bipinnatifid, segments obtuse, oblong, serrate, or incised, smooth, dark-green, glandular, involucre imbricated, receptacle convex, naked, florets many, yellow, tubular; odor strong, aromatic; taste pungent, bitter. Should be collected while flowering, loses on drying 80–85 p. c. *Solvents:* alcohol; water. Dose, gr. 15–60 (1–4 Gm.).

FIG. 396.



Tanacetum vulgare, flower; *a*, a single flower.

CONSTITUENTS.—Volatile oil ¼ p. c., Tanacetin, $C_{11}H_{16}O_4$, fat, resin, tannin, mucilage, sugar, tartrates, citrates, malates.

Volatile Oil.—Obtained by distillation with water or steam. Consists of terpene, $C_{10}H_{16}$, ketone—tanacetone (thujone, absynthol), $C_{10}H_{16}O$, an alcohol—tanacetyl, $C_{10}H_{18}O$, 20 p. c.; it is a greenish-yellow liquid, sp. gr. 0.925 (fresh herb), 0.954 (dry herb), camphoraceous odor, bitter pungent taste, soluble in 3 parts of alcohol (70 p. c.). Dose, ♏j–5 (.06–.3 Cc.).

Tanacetin.—Bitter principle, extracted like digitalin; granular, bitter, then cooling and caustic, precipitated by tannin, insoluble in ether.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Infusion*, 5 p. c. Dose, ℥j–2 (30–60 Cc.).

PROPERTIES.—Stimulant tonic, emmenagogue, anthelmintic, diuretic, narcotic. Large doses produce vomiting, epileptic convulsions, coma, mydriasis, feeble respiration and pulse, death from paralytic asphyxia. Of the oil ʒj–4 (4–15 Cc.) usually kills; large doses of the infusion or tea have proven fatal.

USES.—Intermittents, hysteria, amenorrhœa, colic. Locally, bruises, sprains, rheumatism, ulcers. Used as a domestic abortifacient, but doses sufficient to abort frequently kill, hence is a very dangerous medicine.

Allied Plants:

1. *T. vulgare* var. *cri′spum, Double Tansy.*—Leaves twice pinnatifid, curled; *T. Balsami′ta* (*Pyre′thrum Tanace′tum*). S. Europe, odor strong, taste bitter; both often cultivated and used similar to the official.

COMPOSITÆ.

ABSINTHIUM. ABSINTHIUM (WORMWOOD).

Artemisia Absinthium, *Linné.* } The leaves and tops, collected while flowering.

Habitat. Europe, N. Asia, N. Africa, mountains and hills, naturalized in N. America, along roadsides and in waste places; cultivated.

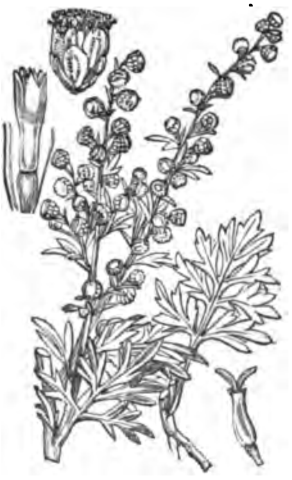
Syn. Absinth, Mader, Mug or Ming-wort, Warmot. Fr. Absinthe commune, Grande Absinthe, Armoise, Amère, Aluine. Ger. Herba or Summitates Absinthii, Wermuth, Alsei.

Ar-te-mis′i-a. L. fr. Gr. Ἀρτεμις, the Goddess; Roman Diana, to whom this plant was dedicated owing to its use in hastening puberty.

Ab-sin′thi-um. L. fr. Pers. Gr. ἀψίνθιον, wormwood, classic name for several plants of this genus.

PLANT.—Perennial herb; stem .6–1 M. (2–3°) high, several; LEAVES, 2.5–7.5 Cm. (1–3′) long, hoary, grayish-green, bracts 3-cleft or entire; flowers July–Aug., in heads twice or thrice pinnatifid, segments lanceolate, silky-pubescent, 3 Mm. (⅛′) long, numerous, racemose, subglobose, with involucre, receptacle convex, hairy, florets yellow; fruit achene, obovoid without pappus; odor aromatic; taste very bitter. *Solvents:* boiling water; diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

FIG. 397.



Artemisia Absinthium.

CONSTITUENTS.—Volatile oil 1 p. c., Absinthin, anabsinthin; tannin, resin absinthic (succinic) acid; malates, nitrates (potassium, etc.), ash 7 p. c.

Volatile Oil.—Obtained from the fresh herb by distillation; dark-green liquid, becoming brown by age, soluble in equal quantity alcohol (85 p. c.) with strong plant-odor, aromatic, sp. gr. 0.940. Consists mainly of absinthol (thujone), $C_{10}H_{16}O$ (with zinc chloride splitting into water and cymene, $C_{10}H_{14}$), + terpenes 2 p. c., and a deep-blue oil in the higher boiling portions. Adulterated with alcohol, oil of turpentine, etc., which lessens the specific gravity. Dose, ♏j–2 (.06–.13 Cc.).

Absinthin, $C_{15}H_{20}O_4$.—Intensely bitter, white, amorphous, glucoside; obtained by precipitating infusion with tannin; soluble in water, alcohol.

PREPARATIONS.—(Unoff.) *Fluid Extract.* Dose, ♏xv–60 (1–4 Cc.). *Extract.* Dose, gr. 1–10 (.06–.6 Gm.). *Infusion.* Dose, ℥j–2 (30–60 Cc.). *Tincture.*

PROPERTIES.—Tonic, stomachic, stimulant, febrifuge, anthelmintic.

USES.—Atonic dyspepsia, lumbricoid worms. The oil in the form of *absinthe liqueur* (oil + anise oil + alcohol) is a narcotic, stimulant in cerebral exhaustion, while alone it is locally an anæsthetic for rheumatism, neuralgia, etc.

Allied Plants:

1. *A. Abro′tanum, Southern-wood, Old Man.*—Asia, Europe; hairy,

segments of the pinnatifid leaves capillaceous, lemon-odor. *A. vulga'ris, Mugwort.* Africa, Europe, spontaneous in United States; stem purple; epilepsy, amenorrhœa. *A. gnaphalo'des* (*A. ludovicia'na* var. *gnaphalodes*), *Western Mugwort.* Mich. to Oregon; febrifuge. *A. abyssi'nica.* Abyssinia; has woolly involucre, whitish florets; aromatic odor.

SANTONICA. SANTONICA (LEVANT WORMSEED).

Artemisia pauciflora, (*Ledebour*) *Weber.* } The unexpanded flower-heads.

Habitat. N. Turkestan, Russia, on the vast plains of Kirghiz.

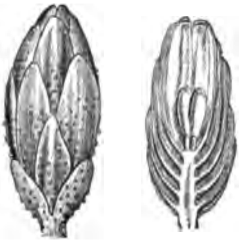
Syn. Aleppo—Alexandria or European Wormseed, Tartarian Southern Wood, Semen Santonici—Cynæ—Sanctum or Contra. Fr. Barbotine, Semencine. Ger. Flores Cinæ, Wurmsamen, Zittwersamen.

Pau-ci-flo'ra. L. *paucus*, few, +*florus*, flower; *i. e.*, has few blooms, mostly only buds.

San-ton'i-ca. L. *santonicus*, pertaining to the Santoni, people of Aquitania (Gr. *σαντονικόν*, their wormwood), named in commemoration, which name survives to the place Saintes, in France.

PLANT.—Small, semi-shrubby perennial, with knotty, fibrous root-stocks, branching from crown, from which many erect, flowering stems arise, .3 M. (1°) high; stems 6–8, woolly or glabrous, at first leafy; leaves bipinnatisect, 12 Mm. ($\frac{1}{2}'$) long, woolly when young, afterward grayish. FLOWERS, 2–4 Mm. ($\frac{1}{12}$–$\frac{1}{6}'$) long, 1 Mm. ($\frac{1}{25}'$) wide, oblong-ovoid, obtuse, smooth, glossy, grayish-green, after exposure to light brownish-green, consisting of an involucre of 12–18, closely imbricated, glandular scales, with a broad midrib, enclosing 4–5 rudimentary florets; odor strong, peculiar, camphoraceous; taste aromatic, bitter. *Solvents:* diluted alcohol; hot water partially. Dose, gr. 15–60 (1–4 Gm.).

FIG. 398.



Santonica; head and longitudinal section, magnified 10 diam.

Commercial.—The source *Artemisia mari'tima* var. *pauciflora* is equally correct and preferred by some writers, despite it having escaped far from its original maritime habitat. In Europe have two commercial varieties: 1. *Aleppo, Alexandria, Levant.* 2. *Barbary* (*A. Siebe'ri* and *A. ramo'sa*). The former is forwarded to the fair of Nizhnee-Novgorod, and thence enters market via Moscow, St. Petersburg, W. Europe; the latter is rarely met with, as it (flower-heads) contains no santonin.

CONSTITUENTS.—Santonin 1–2 p. c., Volatile oil 2 p. c., artemisin, $C_{15}H_{18}O_4$ (in santonin mother-liquor, recrystallizing pure from chloroform), resin, gum.

Santoninum. Santonin, $C_{15}H_{18}O_3$, *official.*—(Syn., Anhydrous Santoninic Acid; Fr. Santonine; Ger. Santonin.) Neutral principle discovered in 1830; obtained by mixing powdered santonica with slaked lime, exhausting with hot water; the filtered solution, containing calcium santonate, is concentrated and decomposed with hydrochloric acid, giving calcium chloride in solution and santonin precipitated; it occurs in white, shining, odorless, slightly bitter prisms, yellow on exposure, no residue, soluble in 40 parts alcohol, 4 chloroform, and in alkalies. *Tests:* 1. Dissolves in nitric or sulphuric acid without color; the latter solution turns red by standing, or violet upon adding ferric chloride; water added to red solution gives brown resinous precipitate. 2. With alcoholic solution of potassa get pinkish-red liquid, becoming colorless. 3. Solution in sulphuric acid is colorless (abs. organic substances), but turns yellow, red, brown; if to this fresh solution we add water, get complete precipitation of santonin, and the supernatant, colorless liquid should neither be bitter nor altered by potassium dichromate T. S. (abs. brucine, strychnine), or by mercuric potassium iodide T. S. (abs. alkaloids). It should be kept dark, in amber vials, as sunlight converts it, owing to resinous nature, into yellow photo-santonic acid, $C_{15}H_{22}O_5$. Heating with alkalies converts it into santoninic acid, $C_{15}H_{20}O_4$, while long boiling with baryta water changes it into the isomeric santonic acid. Dose, gr. 1–4 (.06–.26 Gm.); child gr. ¼–1 (.016–.06 Gm.).

ADULTERATIONS.—Salicin, boric acid, strychnine, picric acid. Add sulphuric acid to santonin, at first colorless (abs. salicin, which turns red). Boric acid gives green color to alcohol-flame, and heated upon foil leaves glassy mass, the solution of which turns turmeric paper brown. Picric acid explodes by heat or percussion; forms yellow salts and precipitates gelatin in aqueous solution.

Volatile Oil.—Obtained by distilling with water or steam; yellowish, disagreeable odor; consists mainly of cineol, $C_{10}H_{18}O$, some dipentene, sp. gr. 0.930, when shaken with iodine get greenish crystals.

PREPARATIONS.—1. *Trochisci Santonini.* Troches of Santonin. (Syn., Santonin Lozenges; Fr. Tablettes (Pastilles) de Santonine; Ger. Santonin-pastillen.)

Manufacture: Santonin 3 Gm., sugar 110, tragacanth 3, stronger orange flower water q. s. 100 troches. Dose, 1–6 troches.

Unoff. Preps.: I. FLOWER-HEADS: *Infusion, Extract, Electuary.* II. SANTONIN: *Sodii Santoninas,* official, 1880–1890. Dose, gr. 2–10 (.13–.6 Gm.). *Trochisci Sodii Santoninatis,* official, 1880–1890 (each gr. 1; .06 Gm.). Dose, 1–4 troches. *Santoninic Acid.* Dose, gr. 1–4 (.06–.26 Gm.).

PROPERTIES.—Anthelmintic, stimulant, emmenagogue. The Crusaders introduced santonica into Europe, and it has been used there ever since, mostly now as santonin. It is absorbed as sodium santoninate, and eliminated by the kidneys; large doses dilate pupils, causing gastric oppression, nausea, vomiting, diarrhœa, thirst, cold clammy skin, giddiness, cerebral congestion, yellow field of vision (xanthopsia) going to purplish-red, convulsions, death. Santonin in 5-grain (.3-Gm.) doses is a strong diuretic, turning normal acid-urine saffron color (as does rhubarb), which, by age, hence alkalinity, becomes violet-purple. A child five years old was killed by two grains (.13 Gm.).

USES.—For roundworms (*Ascaris lumbricoides*), somewhat for threadworms (*Oxyuris vermicularis*), but never for tapeworm. Santonin kills the roundworms that inhabit the small intestine, therefore, purgatives having specific action here should be selected. Give the powder in honey, molasses, to which calomel or jalap has been added, at bedtime, having fasted that day; follow this next morning, before food, with a draught of senna or a dose of castor oil. A suppository is very good for threadworms. May reserve entire cathartic until next morning if desirable. Good in incontinence of urine, eye affections, inflammatory changes of optic nerve and retina. Never give to children with fever, nor while constipated, owing to possible toxic results, which are combated by ammonia, strychnine, eliminants, artificial respiration.

Allied Products:

1. *Barbary Wormseed* (*A. ramo'sa*).—N. W. Africa. Unexpanded flower-heads are rounder than the official and are covered with whitish down, by which they can be readily recognized.

2. *Indian Wormseed.*—Europe. Only half size of santonica, hairy and more yellow. The American wormseed are often substituted for santonica, but their resemblance, on close inspection, is very slight.

ARNICA. ARNICA.

1. ARNICÆ FLORES. Arnica Flowers.
2. ARNICÆ RADIX. Arnica Root.

Arnica montana, *Linné.* } 1. The flower-heads. 2. The rhizome and roots.

Habitat. Europe—Germany, Switzerland (Alps, Pyrenees), N. Asia, N. W. America, in mountains, and moist upland meadows.

Syn. Leopard's-bane, Wolf's-bane, Mountain Arnica or Tobacco. Br. Arnicæ Rhizoma. Fr. Fleurs (d'Arnique) d'Arnica, Racine d'Arnica. Ger. Flores Arnicæ, Fallkraut, Arnika(blüthen, or wurzel), Wohlverleich(blüthen or wurzel).

Ar'ni-ca. L. fr. Gr. *ἀρνάκις*, a sheep's skin; *i. e.*, resemblance of hairy stem and leaves, or from *πταρμικ* [*ός ή*]; *i. e.*, causing one to sneeze.

Mon-ta'na. L. *montanus*, mountainous, from its preferred place of growth.

PLANT.—Perennial herb; stem .3 M. (1°) high, hairy, striate; leaves—radical oblong-ovate, entire, ciliated, obtuse—cauline lanceolate, both kinds bright-green, pubescent; achenes crowded with pappus. FLOWERS, May–June, yellow, 2.5–5 Cm. (1–2′) broad, involucre in two rows, receptacle flat, hairy, bearing 16 yellow strap-shaped, 10-nerved ray-florets and many 5-toothed tubular disk-florets, having slender, spindle-shaped achenes, crowned by hairy pappus; odor aromatic; taste pungently aromatic, bitter. Dose, gr. 5–20 (.3–1.3 Gm.). RHIZOME, 5 Cm. (2′) long, 2–4 Mm. ($\frac{1}{12}$–$\frac{1}{6}$′) thick, brown, wrinkled, rough from leaf-scars, internally whitish, bark thick, with circle of resin-cells, wood-wedges yellow, enclosing large pith; roots numerous, thin, fragile, 10 Cm. (4′) long; odor aromatic; taste pungently aromatic, bitter. *Solvents:* diluted alcohol; hot water. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—I. FLOWERS: With many Compositæ as *Cale'-*

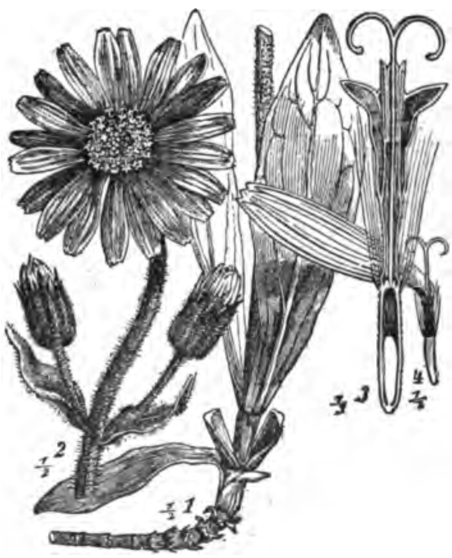
ndula, *A'nthemis* (both without pappus), *I'nula*, *Doro'nicum*, *Sene'cio* (naked receptacle), *Scorzone'ra* and *Tragopo'gon* (florets all ligulate). II. Rhizome: With other Compositæ, also *Ge'um urba'num* (this has a true root with rootlets on all sides; taste astringent), *Fraga'ria ve'sca* (strawberry), rhizome darker, not annulate, has starch, no resin-cells.

Commercial.—Flowers are mostly used in medicine; they lose 75 p. c. on drying, and in Germany are deprived of involucre and receptacle when to be used in pharmacy, because these parts are often seriously attacked by black larva of the arnica-fly (*Trype'ta arnici'vora*), an insect which must always be removed when found. Rhizome is collected in spring and should invariably be deprived of radical leaves.

Constituents.—Arnicin, $C_{12}H_{22}O_2$, volatile oil ½–1 p. c., resin, fat, salts. Have additionally, in the rhizome, capronic and caprylic acids, inulin 10 p. c., tannin, mucilage.

Arnicin.—A glucoside obtained by passing tincture through animal charcoal, evaporating, adding to residue ether, which dissolves arnicin and fat, and this shaken with alcohol dissolves out arnicin. It is yellow, amorphous, acrid taste, soluble in alcohol, ether, alkalies (NH_4OH, KOH, $NaOH$, $NaHCO_3$), slightly in water.

FIG. 399.



Arnica montana; 1, rhizome and stem; 2, flowering stem; 3, vertical section of disk-flower; 4, ray-floret.

Preparations. — I. Flowers: 1. *Tinctura Arnicæ Florum.* Tincture of Arnica Flowers. (Syn., Fr. Teinture (de fleur) d'Arnica; Ger. Tinctura Arnicæ, Arnikatinktur.)

Manufacture: 20 p. c. Percolate 20 Gm. with diluted alcohol q. s. 100 Cc. Dose, ♏xv–45 (1–3 Cc.). If ammonia water (ʒj; 4 Cc. to Oij; 1 L.) be added to the moistening menstruum we get a much darker colored preparation, and one just as efficient.

II. Rhizome: 1. *Extractum Arnicæ Radicis.* Extract of Arnica Root. (Syn., Fr. Extrait de Racine d'Arnique; Ger. Arnika-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. Dose, gr. 1–3 (.06–.2 Gm.).

Prep.: 1. *Emplastrum Arnicæ.* Arnica Plaster. (Syn., Fr. Emplâtre d'Arnique; Ger. Arnikapflaster.)

Manufacture: Melt resin plaster 67 Gm., to this add extract of arnica root 33 Gm., mix.

2. *Extractum Arnicæ Radicis Fluidum.* Fluid Extract of Arnica Root. (Syn., Fr. Extrait liquide de Racine d'Arnique; Ger. Flüssiges Arnikawurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 75 p. c., q. s. 100 Cc. Dose, ♏v–10 (.3–.6 Cc.).

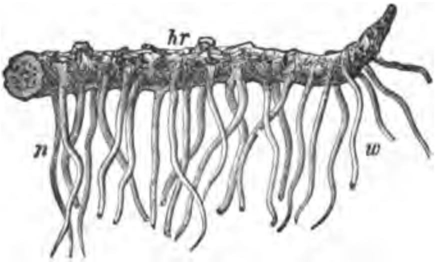
3. *Tinctura Arnicæ Radicis.* Tincture of Arnica Root. (Syn., Br. Tinctura Arnicæ; Fr. Teinture de Racine d'Arnica; Ger. Arnikawurzeltinktur.)

Manufacture: 10 p. c. Macerate, percolate 10 Gm. with alcohol 65 p. c., q. s. 100 Cc. Dose, ♏v–20 (.3–1.3 Cc.). The rhizome preparations are preferred internally.

Unoff. Preps.: I. FLOWERS: *Fluid Extract.* Dose, ♏v–20 (.3–1.3 Cc.). *Extract.* Dose, gr. 1–3 (.06–.2 Gm.). *Infusion.* Dose, ℥ss–1 (15–30 Cc.). *Fomentation.* II. RHIZOME: *Decoction,* 5 p. c. Dose, ʒiv (15 Cc.).

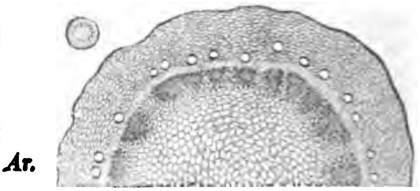
PROPERTIES.—Stimulant, tonic, carminative, diuretic, nervine, emmenagogue, irritant, sternutatory, vulnerary. Large doses emetic, cathartic, causing abdominal pains, headache, collapse, resembling aconite.

FIG. 400.



Arnica montana; *hr*, rhizome; *n–w*, roots.

FIG. 401.



Arnica; transverse section of rhizome, natural size, and magnified 12 diam.

USES.—Typhoid condition, brain concussion, intermittents, dysentery, diarrhœa, gout, nephritis, rheumatism, dropsy, amaurosis, chlorosis, amenorrhœa, chronic catarrh, paralysis, nervous affections. The natives of Savoy and the Vosges use the flowers and leaves as a substitute for tobacco. Locally in paralysis, sprains, bruises, abrasions, hence the German name Fallkraut, accident plant. Atropine best antidote.

Allied Plants:

1. *A. folio'sa, A. alpi'na,* and *A. Chamisso'nis.*—Cal. to Me. These have flowers closely resembling the official.

LAPPA. LAPPA (BURDOCK).

Arctium Lappa, *Linné,* and other species. } The roots.

Habitat. Europe, N. Asia, naturalized in N. America, in waste places, roadsides.

Syn. Clotbur, Clet-bur, Grass Burdock, Bardana, Beggar's or Billy-Buttons, Bourholm, Clive, Burr Seed, Hardock, Hareburr, Hurr Burr, Turkey Bur Seed. Fr. Bardane, Glouteron. Ger. Radix Bardanæ, Klettenwurzel.

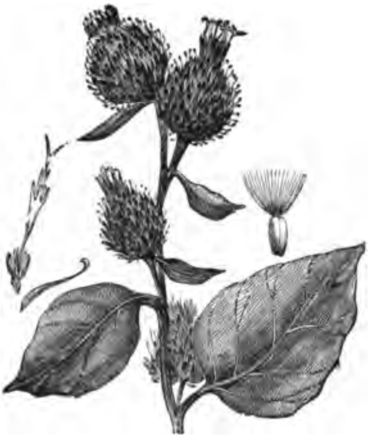
COMPOSITÆ.

Arc′ti-um. L. fr. Gr. ἀρκτος, a bear; *i. e.*, from rough involucre of flower and fruit.

Lap′pa. L. a bur, fr. Gr. λαβεῖν, to seize; *i. e.*, thorny fruit holds fast to animals, clothing, etc. *Burdock* = Dock plant that produces a bur.

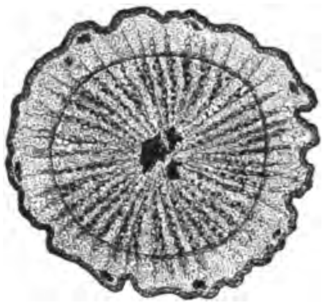
PLANT.—Coarse biennial weed; stem .6–2 M. (2–6°) high, branched; leaves cordate-oblong, dentate, rough, petiolate; flowers July–Sept., purple, middle-sized heads; calyx consists of imbricated scales with hooked extremities by which they adhere to objects; achenes oblong, compressed, 3-angled, ribbed; seed quadrangular. The var. *major* or *majus* has broad heads, 2.5 Cm. (1′) wide, smoothish involucre; var. *tomentosum* has involucre and peduncles woolly; var. *minor* or *minus* has heads small, involucre at first cottony, finally smooth, leaves unequally rounded at base. ROOT, .25–.8 M. (10–30′) long, 12–25 Mm. (½–1′) thick, simple, fusiform, fleshy, longitudinally wrinkled, crowned with a tuft of whitish, soft, hairy leaf-stalks, grayish-brown, inside paler, fracture somewhat horny; bark thick, inner part and wood radially striate, cambium line dark, meditullium four times thicker than bark, consisting of equal width ligneous and medullary rays, this latter and parenchyma free from starch and often partly destroyed, leaving white dead tissue, full of cavities and spongy; odor feeble, unpleasant; taste mucilaginous, sweetish, bitter. Should be collected in autumn of the first year's growth, or early in succeeding spring, and in drying loses 85 p. c. *Solvents:* diluted alcohol; boiling water partially. Dose, ʒss–2 (2–8 Gm.).

FIG. 402.



Arctium Lappa.

FIG. 403.



Lappa; transverse section, magnified 2 diam.

CONSTITUENTS.—Inulin, bitter extractive, resin, fat 9 p. c., mucilage, sugar, tannin, glucoside (? olive-green with Fe_2Cl_6), ash 3–4 p. c.

Inulin.—This takes the place of starch, and in fall and spring is frequently present to the extent of 45 p. c.

PREPARATIONS.—1. *Extractum Lappæ Fluidum.* Fluid Extract of

Lappa. (Syn., Fluid Extract of Burdock. Fr. Extrait liquide de Bardane. Ger. Flüssiges Klettenwurzel-Extrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Extract. Dose, gr. 5–20 (.3–1.3 Gm.). *Decoction.* Dose, ℥ij–4 (60–120 Cc.). *Infusion.* Dose, ℥ij–4 (60–120 Cc.). *Tincture,* 10 p. c. (diluted alcohol or whiskey). Dose, ʒij–3 (8–12 Cc.), after meals. *Syrup.*

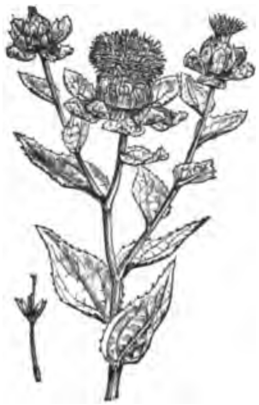
PROPERTIES.—Diaphoretic, diuretic, alterative, aperient, depurative.

USES.—Rheumatism, gout, pulmonary catarrh, chronic skin diseases, psoriasis, acne, syphilis, scrofula, urinary deposits. Externally, swellings, hemorrhoids, burns, wounds, ulcers, eruptions.

Allied Substitutions:

1. *Fructus Lappæ. Semen Bardanæ.*—Seed official, 1830–1840; about 6 Mm. ($\frac{1}{4}'$) long, obovate-oblong, slightly curved, angular, flattened, roughish, brown-gray, mottled with black; inodorous; taste oily, bitter; contains drying oil 15.4 p. c., resins 5.5 p. c., lappin. Tincture 25 p. c. (alcohol 75 p. c.). Dose, ʒss–2 (2–8 Cc.); fluid extract. Dose, ♏xv–30 (1–2 Cc., tonic); ʒss–1 (2–4 Cc., alterative).

FIG. 404.



Carthamus tinctorius.

2. *Fructus Silybi.* (*Si'lybum maria'num.*) *Mary Thistle.*—S. Europe; achenes 5 Mm. ($\frac{1}{5}'$) long, not curved, obovate, flattened, smooth, glossy, light-brown, with blackish striæ, brown; taste oily, bitter.

3. *Xa'nthium struma'rium, Broad Cocklebur.*—Ambrosiaceæ. N. America; achenes 2.5 Cm. (1′) long, flat, oblong, without pappus, enclosed in the involucre, which is densely beset with hooked prickles.

4. *X. spino'sum, Spiny* or *Thorny Clotbur.*—N. America, S. Europe. Leaves petiolate, lanceolate, dentate, stipulate spines at the base, 2.5 Cm. (1′) long; fertile axillary burs (achenes) crowned with one inconspicuous beak.

5. *X. canade'nse,* and its var. *echina'tum.*—Achenes with two stout beaks, hooked, 2.5 Cm. (1′) long, densely prickly, hispid. River banks, waste places; var. *echina'tum,* smaller plant on sandy sea and lake shores; by some claimed unworthy of variety distinction.

6. *Ca'rthamus tincto'rius, Safflower.*—The florets official, 1820–1880. India, cultivated. America, etc. Annual herb .3–.6 M. (1–2°) high, branched; leaves lanceolate, spinose; flowers orange-red, corolla tubular, 2.5 Cm. (1′) long, 5-lobed, odor slight, taste bitter. Contain carthamin 0.5 p. c., yellow coloring matter 20 p. c. Used as diaphoretic (hot infusion), tonic, laxative for measles, scarlatina (to promote eruptions), catarrh, rheumatism; in infusion. Dose, gr. 5–15 (.3–1 Gm.).

RECAPITULATION No. 11.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
1. Calendula. 2. Calendula (Marigold).	Calendula officinalis.	The florets.	S. Europe, Levant.	Volatile oil, calendulin, bitter principle, gum.	Tincture.	Stimulant, tonic, febrifuge, anthelmintic.	Jaundice, amenorrhœa, fevers, scrofula, ulcers, cancers, sprains, bruises, wounds.	15-60 (1-4 Gm.)
1. Anthemis. 2. Anthemis (Chamomile).	Anthemis nobilis.	The flowering heads.	S. and W. Europe.	Volatile oil, anthemene, anthemic acid. resin, tannin.	....	Stimulant, tonic, nervine, carminative, emmenagogue.	Indigestion, debility, intermittents, torpid liver, delirium tremens, sprains, toothache, colic, ulcers, rheumatism.	15–60 (1–4 Gm.)
1. Matricaria. 2. Matricaria (German Chamomile).	Matricaria Chamomilla.	The flowering heads.	Europe, W. Asia.	Volatile oil, anthemic acid, anthemidin, tannin.	....	Stimulant, tonic, nervine, carminative, emmenagogue.	Indigestion, convalescence, intermittents, delirium tremens, abscesses, colic, toothache, rheumatism, sprains.	15–60 (1–4 Gm.)
1. Pyrethrum. 2. Pyrethrum (Pellitory).	Anacyclus Pyrethrum.	The root.	N. Africa.	Pyrethrin, pyrethrine, inulin, tannin.	Tincture.	Irritant, rubefacient, sialagogue, sternutatory.	Headache, rheumatism, toothache, tongue paralysis, catarrh, neuralgia.	30–60 (2–4 Gm.)
1. Tanacetum. 2. Tansy.	Tanacetum vulgare.	The leaves and tops.	Asia, Europe.	Volatile oil, tanacetin, fat, resin, tannin, tartrates.	....	Stimulant, tonic, emmenagogue, diuretic, anthelmintic.	Hysteria, intermittents, amenorrhœa, colic, sprains, ulcers, rheumatism.	15–60 (1-4 Gm.)
1. Absinthium. 2 Absinthium (Wormwood).	Artemisia Absinthium.	The leaves and tops.	Europe, N. Asia.	Volatile oil, absinthin, tannin, resin.	....	Tonic, stomachic, febrifuge, anthelmintic.	Dyspepsia, worms, rheumatism, neuralgia.	15–60 (1–4 Gm.)
1. Santonica. 2. Santonica (Levant Wormseed).	Artemisia pauciflora.	The unexpanded flower-heads.	N. Turkestan.	Santonin, volatile oil, resin, gum.	*Santonin*: troches.	Anthelmintic, stimulant, emmenagogue.	Round and thread-worms, incontinence of urine, eye troubles.	15–60 (1–4 Gm.)
1. Arnicæ Flores. 2. Arnica Flowers.	Arnica montana.	The flower-heads.	Europe, N. Asia.	Arnicin, volatile oil, resin, salts.	Tincture.	Stimulant, tonic, carminative, diuretic, emmenagogue, irritant.	Typhoid, intermittents, diarrhœa, dysentery, gout, nephritis, amaurosis, amenorrhœa, rheumatism, dropsy, catarrh, paralysis, nervine.	5–20 (.3-1.3 Gm.)
1. Arnicæ Radix. 2. Arnica Root.		The rhizome and roots.			Extract, plaster, fld. extr., tinct.			
1. Lappa. 2. Lappa (Burdock).	Arctium Lappa.	The root.	Europe, N. Asia.	Inulin, resin, bitter extractive, fat, glucoside.	Fluid extract.	Diaphoretic, diuretic, alterative, aperient.	Rheumatism, catarrhs, skin diseases, syphilis, scrofula, burns, ulcers, wounds.	30–120 (2–8 Gm.)

PART II.

ORGANIC DRUGS FROM THE ANIMAL KINGDOM.

THE ANIMAL KINGDOM is divided into two great sub-kingdoms, viz:

I. Invertebra'ta. L. fr. *in*, not, + *vertebratus*, vertebrated; *i. e.*, not vertebrated. These have no vertebra, backbone or spinal column.

II. Vertebra'ta. L. fr. *vertebratus*, jointed, articulated; *i. e.*, vertebrated. These have a backbone (spinal bone) surrounding, and thus protecting the spinal cord, often called conjointly spinal column.

SUB-KINGDOM I. **INVERTEBRATA.**

CLASS: **INSECTA.** L. pl. of *insectum*. This class includes those small animals that have one pair of antennæ, three pairs of mouth organs, and breathe air by means of tracheæ, opening by spiracles along the sides of the body, as hexapods (six-legged) and myriapods (many-legged).

1. HEMIPTERA. Hemipterous Family.

He-mip'te-ra. L. neut. pl. of *hemipterus*, half-winged, fr. Gr. ἡμι, half, + πτερόν, wing; *i. e.*, insects have forewings partly membranous and partly coriaceous, chitinous. This family includes the various kinds of bugs; they are hexapod insects, having a jointed proboscis, including four sharp stylets (mandibles and maxillæ) for piercing and sucking; have no sucking stomach. They feed upon plant juices or animal blood. The metamorphosis is mostly incomplete; the molt is, as a rule, repeated 4 times, the stage next to the last, preceding the imago, being called pupa. Includes squash-bug, soldier-bug, bed-bug, cicadas, cuckoo, spites, plant lice, scale insects, thrips, lice.

Genus: **1. Coccus.**

COCCUS. COCHINEAL.

Coccus cacti, *Linné.* } The dried female insect.

Habitat. Mexico, C. America. Cultivated in W. Indies, Canaries, Algiers, S. Spain.

Syn. Cochineal Insect. Fr. Cochenille. Ger. Coccionella, Scharlachwurm.

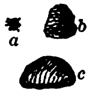
Coc'cus. L. fr. Gr. κόκκος, a grain, berry, kernel; *i. e.*, from the insect resemblance.

Cac'ti. L. gen. of *cactus*, fr. Gr. κάκτος, a prickly plant; *i. e.*, insect feeds upon Cactus species.

Coch'i-ne-al. L. fr. Sp. *cochinilla*, L. *coccineus*, scarlet, *coccum*, a berry; *i. e.*, which the kermes insect resembles, and was once supposed to be.

INSECT.—The female when full-grown is 8 Mm. (⅓') long, 6 Mm. (¼') high, when dry 5 Mm. (⅕') long, purplish-gray or black, oblong, angular in outline, flat or concave beneath, convex above, transversely wrinkled, easily powdered to dark-red color; odor faint; taste bitter; swells in water, but no insoluble powder should separate. Dose, gr. 1–15 (.06–1 Gm.).

FIG. 405.

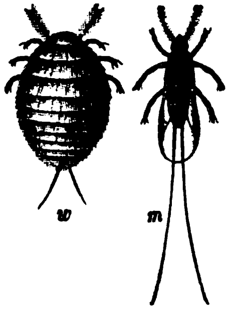


Coccus cacti; female insect natural size; *a*, before, and *b*, *c*, after impregnation, dry, and soaked in water.

ADULTERATIONS. — 1. The silver-gray with barium and lead carbonates or sulphates, talcum, etc. 2. The black with graphite, ivory black, manganese dioxide. 3. Factitious cochineal made of starch, gum, mineral, and coloring matters; also prepared by coloring exhausted cochineal powder with rosaniline, and granulating, recognized by readily forming paste with water. *Tests:* 1. Macerate in water, when the powder separates, the minerals depositing; or burn insects and note the increased ash yield. 2. Cold decoction is decolorized by potassium permanganate, preferably in the presence of a little indigo carmine.

Commercial.—Female is official, being twice the size of the male, has a rostrum, bluish-red body, underside flat, upper convex, no wings or bristles, both of which the male possesses. These feed upon Cactus species, but especially on *Nopa'lea cocheni'llifer* (*Opu'ntia coccinelli'fera*); the females attach themselves to the plant, copulate, and after increasing much in size, lay several thousand eggs; the mother-insect now dies and the body dries up, leaving the eggs to be hatched by the sun. In Mexico, during the rainy seasons, insects are kept on cactus branches under roof, and in good weather are *sown* upon plants, the young ones allowed to develop until females become fecundated and enlarged, when they are brushed from the branches into hot water; thus killed they are then dried by sun or fire, giving the *black cochineal;* if they are killed and dried simply by exposure to direct heat of sun or ovens, we get *silver-gray cochineal.* Some females are always left for propagation, which often yield three harvests before a return of rainy season; the *granilla* or *grana sylvestra* is an inferior variety, composed of smaller and uncultivated insects.

FIG. 406.



Cochineal insects, magnified three diam.; *w*, female; *m*, male.

CONSTITUENTS.—Carminic acid, $C_{17}H_{18}O_{10}$, 10 p. c., Coccerin (wax), $C_{30}H_{60}(C_{31}H_{61}O_3)_2$, fat, moisture 6 p. c., ash 3–5 p. c.

Carminic Acid.—The coloring matter; a glucoside obtained by macerating in ether, treating residue successively with boiling alcohol, from which it deposits upon cooling and spontaneous evaporation; it is brownish-purple, yielding red powder, soluble in water, alcohol, alkalies, precipitated purple by earths, insoluble in fixed and volatile oils. When boiled with diluted sulphuric acid splits into sugar and carmine-red, $C_{11}H_{12}O_7$, a vermilion-red powder, soluble in water, alcohol, and alkalies.

Watery infusion or decoction of cochineal is violet-crimson, brightened by acids, deepened by alkalies; with it zinc, bismuth and nickel salts give lilac precipitates; iron salts a dark-purple or black; tin salts (nitrate, chloride) a brilliant-scarlet; alumina a pigment called *lake*, while that precipitated by acids, animal gelatin, (salts of tin), alum, cream of tartar, or salt of sorrel, is *carmine*, which contains coloring matter (carminic acid) 50–60 p. c., but is often adulterated with vermilion, lead dichromate, and starch, sometimes as much as 60–70 p. c. *Test:* Pure carmine should be entirely soluble in ammonia water.

Wax and Fat, 18 p. c.—The wax (coccerin) forms woolly covering of gray cochineal; the fat consists of myristin, liquid fat, and fat acids.

PREPARATIONS.—1. *Tinctura Cardamomi Composita*, ½ p. c. Dose, ʒj–2 (4–8 Cc.).

Unoff. Preps.: Infusion (*Infusum Cocci*). Dose, ℥ss–1 (15–30 Cc.). *Tincture*, 10 p. c. (diluted alcohol). Dose, ♏xv–30 (1–2 Cc.).

PROPERTIES.—Stimulant, antispasmodic, diuretic.

USES.—Whooping-cough, neuralgia, chiefly for its coloring properties, especially carmine; in tinctures, tooth powders, etc.

Allied Insects:

1. *C. ili'cis.*—Greece (Morea, mountains); inhabits *Quercus cocci'fera;* consists of females, size of a pea, brownish-red; used natively as a dye, and called *kermes, chermes* or *alkermes;* with tin salts gives scarlet-red precipitate like coccus.

2. *Spo'ngia officina'lis, Sponge.*—Ceratospongiæ. The fibrous framework, official, 1820–1850. In seas, attached to rocks, sometimes planted. Animal, the lowest order living in water, composed of amœbiform bodies disposed about a common cavity, with one or more breathing orifices through which water flows in and out. We use the fibrous framework from which the animalcules (gelatinous matter or flesh), gritty and sandy parts have been washed. They are torn from rocks by hands or forks, buried in sand several days, to disintegrate animal matter, soaked, squeezed, and washed. We have several varieties: 1. Mediterranean, Turkey. 2. Zimocca (coast of Greece). 3. Bathing (N. Africa). 4. Sheep's Wool (Bahama, Florida, Nassau). These are yellowish-brown, but are bleached by sulphur dioxide, chlorine, sulphurous acid solution, or dipping into 2–3 p. c. solution of potassium permanganate, washing in 2–3 p. c. solution of oxalic acid. Sponge contains spongin, also NaCl, $CaCO_3$, Mg, Si, Fe, S, P, Br, I, K, ash 3–4 p. c. Used mechanically for cleaning, washing, absorbing liquids, dilating cavities (sponge tents), supporting parts (pessaries) in dysmenorrhœa, to cause premature labor. When compressed usually coated with wax to prevent absorbing moisture, hence expansion.

Spongia Usta, Burnt Sponge.—Official, 1820–1860. Heat sponge in a coffee roaster until one-fourth of weight gone; the residue is mostly charcoal, while 30–35 p. c. is the part used, consisting of calcium sulphate 25–30 p. c., silica 10 p. c., ferrous oxide 9 p. c., also magnesium carbonate, potassium chloride, calcium phosphate, and sodium iodide 2 p. c. Now superseded by iodine.

3. *Sanguisu'ga medicina'lis*, and *S. officina'lis*, *Hirudo*, *Leech.*—Annelida. 1. C. and N. Europe (Swedish, German Leech). 2. S. Europe (Hungarian Leech); in fresh-water ponds. These animals are 7.5–15 Cm. (3–6′) long, smooth, soft, round, flattened, composed of 90–100 rings, disk at each end, in the centre is the mouth, containing three jaws, having many teeth; back olive-green with six reddish stripes dotted with black, belly greenish, sides black spotted or with a black line. The first draws its own weight of blood, the second more, while still a larger quantity flows after leech falls off. They may be made to disgorge the blood by being placed in a solution of salt, although they should not be used again within six months. Used for local depletion.

Calcareous Related Products:

1. *O'strea virginia'na* and *O. e'dulis*, *Testa*, *Oyster-shell.*—Monomya. The inner white layer of the shell, official, 1830–1880. Atlantic and Indian Ocean coasts. Animal has soft, fleshy, suborbicular body, enclosed in a calcareous shell opening by a hinge at one end into two valves (bivalved), the deeper one adhering to a rock, etc. Shell is rough, gray outside; inside white, glossy, smooth. For medicine (testa præparata) they are boiled, outside layer removed and inside one powdered, separating coarse particles by elutriation; contains calcium carbonate 88–98 p. c., calcium phosphate and sulphate, also Mg, Al, Si, Fe_2O_3. Used as antacid for diarrhœa, chronic bowel affections. Dose, gr. 5–30 (.3–2 Gm.).

2. *Oculi'na virgi'nea* and *Cora'llium ru'brum*, *Corallium*, *Coral.*—Octo (Hexa) coralla. Mediterranean Sea, Atlantic Ocean. Polypipherous animals having a skeleton and fleshy portion. The calcareous skeleton is branched like a shrub, and on these branches are the individual animals in tube-like apertures; skeleton is used in medicine; occurs in hard, cylindrical, branching pieces, porous, striate surface, radiating interior, often hollow, inodorous, tasteless, white (first) or red (second). Contains animal matter 8 p. c., $CaCO_3$ 83 p. c., $MgCO_3$ 3.5 p. c., Fe_2O_3 (red coral) 4.25 p. c. Used in tooth powders and as antacid. Dose, gr. 5–30 (.3–2 Gm.).

3. *Se'pia officina'lis*, *Os Sepiæ*, *Cuttle-fish Bone.*—Decapoda. Mediterranean, Atlantic Ocean. A calcareous substance under the skin of the back of the cuttle-fish, often found floating in the water; occurs 12.5–25 Cm. (5–10′) long, 2.5–7.5 Cm. (1–3′) wide, outside hard, smooth; inside porous, friable, inodorous, taste saline; contains $CaCO_3$ 80–85 p. c., NaCl, MgO, Ca phosphate. Used as antacid like chalk, oyster shells, etc., also in tooth and polishing powders, chiefly now for caged birds to rub their bills against.

4. *A'stacus fluvia'tilis*, *Crawfish.*—Decapoda. Russia. The stomach of this contains concretions known as *calculi* (*lapides*) *cancrorum*, *crabs' eyes* or *stones*, which are obtained by washing putrefied animals. These

are circular, 3–10 Mm. (⅛–⅜′) broad, plano-convex, white, hard, inodorous, tasteless; contain animal matter 12–15 p. c., calcium carbonate 63 p. c., calcium phosphate 17 p. c. Used as antacid. Dose, gr. 5–30 (.3–2 Gm.).

2. COLEOPTERA. Coleopterous Family.

Ko-le-op′te-ra. L. pl. of *coleopterum*, fr. Gr. κολεός, a sheath, + πτερόν, a wing—κολεόπτερος, sheath-winged; *i. e.*, insects having the posterior pair of wings membranous and sheathed by the hardened anterior pair, called *elytra*, which, when folded together, usually form a nearly complete covering of the body. This family includes the beetles and weevils, all of which not only have their two pairs of wings arranged as above described, but have their mouth parts, forming two pairs of jaws (mandibles and maxillæ), adapted for chewing. The larva is variable, having six legs or none, no prolegs, pupa inactive; metamorphosis is complete.

Genus: 1. **Cantharis.**

CANTHARIS. CANTHARIDES (SPANISH FLIES).

Cantharis vesicatoria, *De Geer.* } The beetle.

Habitat. S. and C. Europe, W. Asia.

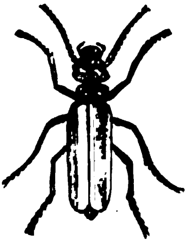
Syn. Spanish Fly, Blister Beetle, Muscæ Hispanicæ, Lytta vesicatoria. Fr. Cantharides. Ger. Cantharides, Spanische Fliegen, Canthariden, Kanthariden.

Can′tha-ris. L. pl. *cantharides*, a beetle, fr. Gr. κανθαρίς, a beetle, Spanish fly; *i. e.*, the classic name.

Ves-i-ca-to′ri-a. L. *vesica*, a blister, of or belonging to, or capable of blistering.

INSECT.—2.5 Cm. (1′) long, 6 Mm. (¼′) broad, flattish-cylindrical, antennæ filiform, black in upper part, with long wing-cases, and ample, membranous, transparent brownish wings, elsewhere of a shining coppery-green color; powder grayish-brown, containing green, shining particles; odor strong, disagreeable; taste slight, afterwards acrid. It should be thoroughly dried at less than 40° C. (104° F.), and kept in well-closed vessels. *Solvents:* alcohol; chloroform. Dose, gr. ⅙–1 (.01–.06 Gm.).

FIG. 407.



Cantharis vesicatoria.

ADULTERATIONS.—With other beetles easily recognizable, exhausted flies, beads, etc., the powder, with ground gum-resin euphorbium, etc.; all detected by diminished yield of cantharidin and increased amount of ash, which should not exceed 8 p. c.

Commercial.—Spanish flies are mostly from Spain, Italy, Sicily, S. France, Hungary, S. Russia; their odor is penetrating, resembling that of mice, by which their approach in swarms can easily be recognized; they attach themselves to trees and shrubs chiefly of the Oleaceæ and Caprifoliaceæ, as ash, white poplar, privet, lilac, elder, honeysuckle, etc. Upon these they swarm in May–June, when persons masked and gloved go at early morn to collect them, they being then more or less stupid from night-coldness. After spreading down cloths the trees are shaken or beaten with poles; the beetles are gathered up and plunged into hot water, or diluted vinegar, or exposed to vapors of either vinegar, chloroform, ether, oil of turpentine, ammonia or carbon disulphide. Thus killed they are spread out, dried by sun or ovens and packed in boxes or casks for market. Russian-flies enter commerce via St. Petersburg, are copper-colored, larger, and more esteemed than those of W. Europe. All blistering beetles should be kept dry, in air-tight vessels, with a little camphor, chloroform, ether, or oil of turpentine, which protects them from ravages of mite-larva, etc.

CONSTITUENTS.—Cantharidin, $C_{10}H_{12}O_4$, 0.4–1 p. c., fat, odorous compound, various extractives and salts, moisture 10 p. c., ash 6–8 p. c.

Cantharidin.—Obtained by exhausting with chloroform, evaporating spontaneously; these crystals have fat and coloring matter adhering, which are removed by carbon disulphide. Occurs in colorless prisms, soluble in alcohol, ether, chloroform, fats, volatile oils, glacial acetic acid, sparingly in water, sublimable, with alkalies yields cantharidates; cantharidin is the blistering principle, and resides mostly in soft parts.

Valuation.—Exhaust with chloroform containing some hydrochloric acid, or acetic ether, evaporate, deprive of fat and color by carbon disulphide; should yield cantharidin 0.4–0.7 p. c.

PREPARATIONS.—1. *Ceratum Cantharidis.* Cantharides Cerate. (Syn., Br. Emplastrum Cantharidis, Blistering Cerate (Plaster); Fr. Emplastrum Vesicans, Emplâtre (vésicatoire) de Cantharides; Ger. Emplastrum Cantharidum (vesicatorium) Ordinarium, Spanischfliegen Pflaster, Blasenpflaster.)

Manufacture: Macerate cantharides 32 Gm. in oil of turpentine 15 Cc. forty-eight hours, then add this to yellow wax 18 Gm., resin 18, lard 22, previously melted and strained; evaporate slowly to 100 Gm.

Prep.: 1. *Emplastrum Picis Cantharidatum,* 8 p. c.

2. *Collodium Cantharidatum,* 60 p. c.

3. *Tinctura Cantharidis.* Tincture of Cantharides. (Syn., Tincture of Spanish Flies; Fr. Teinture de Cantharides; Ger. Tinctura Cantharidum, Spanischfliegen-tinktur.)

Manufacture: 5 p. c. Percolate 5 Gm. with alcohol q. s. 100 Cc. Dose, ♏j–20 (.06–1.3 Cc.).

PROPERTIES.—Diuretic, aphrodisiac, emmenagogue, rubefacient, vesicant, acrid poison. Large doses produce vomiting, bloody stools, scanty urine, passed with pain, depression preceded by increased heart force and rapidity, strangury, swollen genitals, sexual desire, abortion, convulsions, coma, death. Blisters (blebs) are for stimulation, but may produce constitutional symptoms, and if allowed to remain on long they depress according to amount of serum discharged, which contains equal quantities of albumin and blood. Absorbed rapidly into the blood and eliminated by the kidneys with marked irritation.

Locally causes in 2–3 hours tingling, burning pain, vascular dilatation and reflexly dilates deep-seated blood-vessels.

USES.—Hectic fever, dropsy, bronchitis, skin diseases, bladder debility, gleet, vesical catarrh, diabetes, amenorrhœa, seminal emissions, gonorrhœa, menorrhagia; externally, blisters stimulate the whole or part of the system, prevent accumulation of inflamed exudations, recall suppressed discharges, are depletory, and thus cure internal troubles. Applied for ulcers, fistulæ, psoriasis, lupus, erysipelas, boils, alopecia, brain congestion and dropsy, hemorrhage, hydrocele, pleurisy, gleet (under the penis), leucorrhœa (sacrum), dysmenorrhœa, buboes, abscesses, typhus, typhoid fevers, apoplectic condition, inflamed eyes (back of ears), pneumonia, pericarditis, phlebitis, bowel fluxes, rheumatism, neuralgia, spinal irritation, convulsions, tetanus, meningitis, wasting muscles, vomiting.

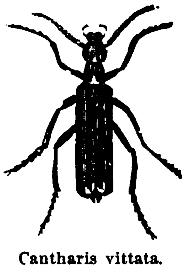
Blisters should remain on 4–8 hours; or until vesicated; this is aided by previously washing the affected part with soap and applying vinegar. If the spot is to be healed at once, cut cuticle off, absorb serum, which is clear, apply pledget of borated cotton and bandage; if the sore is to be prolonged, remove cuticle, apply simple cerate for one day, then basilicon ointment until discharge is purulent, after which so continue as long as desired, with savine or mezereum ointments. In young persons intractable sores are easily produced by blisters, and in old persons gangrene, so they must be applied to both with moderation; in such cases Goulard's cerate is valuable. Strangury may be avoided by sprinkling plaster with spirit or powdered camphor, sodium bicarbonate, or powdered cantharides. The tincture is the internal preparation, and the one used in hair lotions.

Poisoning: Give vegetable emetics, mucilaginous drinks freely—barley water, flaxseed tea, but not oils or oily emulsions, as these favor solubility and absorption of cantharidin; warm baths, and cataplasms to abdomen, opium by mouth, and enema (for pain and gastro-enteritis).

Allied Insects:

1. *C. vitta'ta, Potato Fly.*—Official, 1820–1860. United States. Smaller than official, but both resemble; thorax and wing cases black, the latter with yellow margin and middle stripe, making three yellow bands, head light-red with dark spots on top, abdomen and legs covered with cinereous down 12 Mm. (½′) long. This inhabits Irish or white potato vines, July–Aug., morning and evening, hiding in the soil during hot hours of the day. Collect by shaking into boiling water. Contains cantharidin 1.3 p. c. Used as vesicant like *C. vesicatoria.*

FIG. 408.

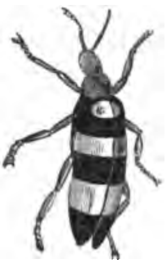


Cantharis vittata.

2. *C. cine'rea* (American; black, closely punctured, covered with ash-gray hairs); *C. margina'ta* (elytra black, margin ash-colored); *C. atra'ta* (black, 8 Mm. (⅓′) long), and *C. Nutta'lli* (Kansas, California, resembles official); wing cases golden-purple striped with green.

3. *Myla'bris cicho'rii*, and *M. phalera'ta*, *Chinese Blistering Flies*.—S. and E. Asia. Black wing-cases with two orange-yellow bands, and at base two yellow spots; powder, with no glossy-green particles; contains 1–1.2 p. c. cantharidin. Our Pharmacopœia only recognizes two insects, cantharis and coccus, while a few countries accept some others, thus: 1. *Formi'ca ru'fa*, *Red Ant*. Used in Germany in spirit and tincture (Tinctura Formicarum—2 parts + alcohol 3) for rheumatism, gout, paralytic affections. Dose, ♏xv–30 (1–2 Cc.). 2. *Bla'tta orienta'lis*, *Cockroach*. Asia. Blackish, 2.5 Cm. (1′) long, broad, flat, habits nocturnal; odor disagreeable. Oily decoction used for warts, ulcers, boils, scaly eruptions; internally for dyspnœa, dropsy, albuminuria, diuretic. Dose, gr. 4–5 (.3 Gm.), per die. 3. *Æ'nas a'fer*. Spain. Has advantages over cantharides in being cheaper, equally powerful, acts without pain, non-irritating to urinary organs.

FIG. 409.



Mylabris cichorii.

3. HYMENOPTERA. Hymenopterous Family.

Hi-me-nop'te-ra. L. neut. pl. of *hymenopterus*, fr. Gr. *ὑμενόπτερος*, membrane-winged—*ὑμήν*, membrane, + *πτερόν*, wing; *i. e.*, animals have membranous wings. This family includes the highest insects, because of their superior structural development, instinctive faculties, and social qualities. They have 4 membranous wings, the anterior pair being the larger, with a thickened dark spot on their front side, few reticulations; the tarsi 4–5-jointed; the tongue or lingua is converted into an organ for sucking honey, liquid food, etc., and the mandibles are adapted to biting or cutting. In bees, wasps and ants the multivalve ovipositor of the female (workers) is modified into a sting.

Genus: 1. **Apis.**

APIS MELLIFICA. THE HIVE OR HONEY BEE.

1. MEL. Honey.
2. CERA FLAVA. Yellow Wax.

Apis mellifica, *Linné*. } 1. A saccharine secretion deposited in the honey-comb by this bee. 2. A peculiar concrete substance prepared by the bee.

Habitat. N. America, Europe.

Syn. 1. Fr. Miel; Ger. Honig. 2. Beeswax, Yellow Wax, Cera Citrina; Fr. Cére jaune; Ger. Gelbes Wachs.

A'pis. L. a bee, Gr. *ἐμπίς*, a giant; *i. e.*, from its classical name.

Mel-lif'i-ca. L. *mellificus*, honey-making, fr. *mel*, *mell*, honey, +*facere*, to make.

ANIMAL.—This is the ordinary honey-bee, which has from the earliest times been hived for its honey and wax. It lives in swarms of 10,000–50,000 individuals, which consist of three kinds or classes of bees, perfect females (queen bees), undeveloped females (neuters or working bees), and males (drones). In each swarm there is only one queen bee, she is much larger than the other bees and her sole function is simply to propagate, laying about 2,000 eggs daily; when she dies a young (three days old) working bee is selected, its cell enlarged, its food changed to royal jelly or paste—thus it soon grows into a queen; there are also several hundred drones whose office it is to impregnate the queen, after which they are destroyed by the neuters; these last being numerous, are the laborers that suck the honey from the flowers with their proboscides, swallow it with their mouths, disgorge it into the honey-cells, and thus feed the other bees, also the young; the pollen which attaches itself to them is utilized as bee-bread for the larva, while adults feed on honey. Wax was once supposed to be formed from pollen, but now is considered a secretion from the honey. The neuters have stings.

1. Mel, Honey.—This is a syrupy liquid, yellowish-brown, translucent when fresh, gradually becoming opaque and crystalline, sp. gr. 1.375, slightly acid, usually levogyrate, characteristic aromatic odor, sweet, acrid taste. The honey from hives which have never swarmed is virgin honey; the finest is allowed simply to drain from the comb, while impure grades are obtained by pressure.

Impurities.—Chlorides, sulphates, glucose, starch, inorganic substances; all increase amount of ash.

Constituents.—Grape sugar or dextrose (becoming crystalline), fruit sugar or levulose (remaining liquid), wax, volatile oil, proteids, mucilage, coloring matter, formic acid, ash 0.1–0.3 p. c., usually suspended pollen grains.

Preparations.—1. *Mel Despumatum.* Clarified Honey. (Syn., Mel Depuratum; Fr. Miel déspumé, Mellite simple, Sirop de Miel; Ger. Gereinigter Honig.)

Manufacture: Mix honey with 2 p. c. washed paper-pulp, heat on water bath until scum ceases to arise, add water q. s. for loss, strain, add glycerin 5 p. c. Dose, *ad libitum.*

Preps.: 1. *Mel Rosæ,* 88 p. c. Dose, *ad libitum.*
2. *Confectio Rosæ:* 12 p. c. Dose, ʒss–1 (2–4 Gm.).

Unoff. Prep.: Oxymel (clarified honey 8, acetic acid 1, water 1)—sometimes used in cough mixtures.

Properties and Uses.—Demulcent, laxative; externally stimulant, nutritive, relieves dryness of mouth, facilitates swallowing; in gargles for aphthæ, thrush, pseudo-membranous deposits; in poultices for boils, carbuncles, fissures of the nipples; in plasters for drying up milk.

II. Cera Flava, Yellow Wax.—The honeycomb, after draining the honey, is melted in water, impurities allowed to subside, then cooled; a second or third melting produces each time a purer product.

It is a yellowish solid, brittle, granular, agreeable honey-like odor; faint balsamic taste, sp. gr. 0.955–0.967, melts at 63° C. (147° F.), soluble in ether, chloroform, fixed and volatile oils, insoluble in water. cold alcohol.

Impurities.—Fats, fatty acids, Japan wax, resin, soap, paraffin, tallow.

CONSTITUENTS.—Hydrocarbons, $C_{27}H_{56}$ and $C_{34}H_{64}$, 12–14 p. c., cerin or cerotic acid, $C_{27}H_{54}O_2$, crystallizes from boiling alcohol; myricin or myricyl palmitate, $C_{30}H_{61}C_{16}H_{31}O_2$ (principal constituent, acicular crystals, soluble in hot ether), an alcohol, $C_{25}H_{52}O$, ceryl alcohol, $C_{27}H_{56}O$.

PREPARATIONS.—1. *Cera Alba.* White Wax. (Syn., Fr. Cire blanche; Ger. Weisses Wachs.)

Manufacture: Yellow wax is bleached by exposure, in thin sheets to moisture, air and sunlight. It is yellowish-white, solid, somewhat translucent in thin layers, slightly rancid odor, insipid taste, sp. gr. 0.965–0.975.

Preps.: 1. *Ceratum,* 30 p. c.
  2. *Ceratum Camphoræ,* 30 p. c.
  3. *Ceratum Cetacei,* 35 p. c.
  4. *Unguentum Aquæ Rosæ,* 12 p. c.

2. *Ceratum Resinæ,* 15 p. c.
3. *Ceratum Cantharidis,* 18 p. c.
4. *Emplastrum Resinæ,* 6 p. c.
5. *Unguentum,* 20 p. c.
6. *Unguentum Picis Liquidæ,* 12.5 p. c.

PROPERTIES AND USES.—Mostly as the bases for plasters, cerates, ointments, formerly in diarrhœa, dysentery, rheumatism, gleet, neuralgia; locally as a protective from cold and to aid cutaneous transpiration.

SUB-KINGDOM II. **VERTEBRATA.**

CLASS: **PISCES.** L. pl. of *piscis,* a fish. This class includes the oviparous animals that have fins and a covering of scales or plates. They breathe by gills, live almost entirely in water, swim instead of walking or flying, have a complete cranium, and a lyriform shoulder girdle.

4. STURIONES. Sturionian Family.

Stu-ri-o'nez. L. pl. of *sturio,* sturgeon, of or pertaining to the sturgeon. These animals have a body elongate, subcylindric, 5 rows of bony bucklers; the snout is produced, subspatulate or conical, with the mouth on its lower surface, small, transverse, protractile, toothless, have 4 barbels in a transverse series on the lower side of snout, a spiracle over each eye.

Genus: 1. **Acipenser.**

ICHTHYOCOLLA. ISINGLASS.

Acipenser Huso, *Linné,* and other species. } The swimming-bladder.

Habitat. Caspian and Black Seas, also tributary rivers, as Volga, etc.

Syn. The Sturgeon, Colla Piscium, Fish Glue, Russian Isinglass. Fr. Ichthyocolle, Colle de Poisson. Ger. Hausenblase, Fischleim.

STURIONES.

Ac-i-pen′ser. L.—Gr. ἀκκιπήσιος, the sturgeon, fr. L. *aci*, Gr. ὠκύς, swift, + a form of L. *penna*, *pinna*, a wing, a fin.

Hu′so. L. fr. Ger. *huse*, *husen*, *hausen*, *huizen*, *huyzen*, *huysen-blas* = *huso* (sturgeon), bladder, from this *huysenblas* we get isinglass.

ANIMAL.—Large fish, 4–4.5 M. (12–15°) long, weighs 1,000 lbs. (455 Kg.) or more, and ranks with whales as regal or royal fishes. Besides the Huso there are several other Russian varieties used for collecting the official "swimming bladder" as Osseter (*A. Güldenstä′dtii*), Sterlet (*A. ruthe′nus*); Starred Sturgeon, Sewruga, Pallas (*A. stella′tus*), and common sturgeon (*A. sturio*).

ICHTHYOCOLLA, ISINGLASS.—Occurs in separate sheets or rolled, horny, pearly, whitish or yellowish, semi-transparent, iridescent, inodorous, insipid, nearly soluble in boiling water and boiling diluted alcohol; it is the purest form of gelatin. A solution of 1 part in 24 boiling water forms on cooling a transparent jelly. Dose, *ad libitum.*

Commercial.—Most fishes have in front of the abdomen a membranous bag containing oxygen and nitrogen in various proportions; it is called "sound" or "swimming-bladder," as by contracting or expanding this fish are supposed to lower or raise themselves in water; it consists of three coats: two interior, thin, delicate; one outer, tough, silvery-white. These bags are removed, split open, washed, deprived of outer layer by scraping and the bladder dried; if stretched into sheets, then dried, we have *leaf isinglass;* if several are folded together, then dried, we have *book isinglass*, or each bladder may be folded up around pegs, giving us *long* or *short staple isinglass;* scraps may be dissolved in boiling water and evaporated to a solid.

CONSTITUENTS.—Gelatin (glutin), insoluble membrane 2–30 p. c., ash 0.5 p. c.

PREPARATIONS.—1. *Emplastrum Ichthyocollæ.* Isinglass Plaster. (Syn., Court Plaster, Emp. Adhæsivum Anglicum, Sparadrapum Taffetas Adhæsivum, Sericum Anglicum; Fr. Sparadrap de Colle de Poisson, Taffetas d'Angleterre; Ger. Englisches Pflaster, Klebtaffet.)

Manufacture: Dissolve isinglass 10 Gm. in hot water q. s. 120 Gm., with brush spread half of this in successive layers upon taffeta (stretched), add to other half alcohol 40 Gm., glycerin 1, apply as before, coat reverse side with tincture of benzoin.

PROPERTIES AND USES.—Slightly nutritious in jelly form, but no better than that from calves' feet; emollient. Chiefly externally as a protective, also for clarifying liquors, to give lustre to fabrics, test for tannin. In chronic bowel trouble of children, mixed with farinaceous food (Coxe's, Nelson's, etc.). The plaster for protecting cuts, abrasions, eruptions of skin. Should always be moistened when applying.

Allied Products:

1. *American Isinglass.*—Sounds of *Ga′dus merlu′ccius* (Hake), and *Oto′lithus rega′lis* (Weakfish) dried in thin sheets or ribbons.

2. *Purse* or *Pipe Isinglass.*—Dried fish-sounds without being cut open. Used sometimes in the arts as isinglass.

3. *Japanese* or *Chinese Isinglass* (Agar-agar).—A vegetable product from *Eucheu'ma spino'sum*, *Sphæroco'ccus lichenoi'des*, and other Algæ.

4. *Gelatin*, *Gelatina*.—Gelatinous tissues, as skins, tendons, ligaments, bone-cartilage, etc., are boiled in water until dissolved and the resulting jelly dried in the air; occurs in translucent sheets, layers, or shreds; forms colorless, inodorous solution in hot water, and 1 part to 50 solidifies to a jelly upon cooling; inferior kinds called *glue*, which dissolved in diluted acetic acid forms *liquid glue;* insoluble in alcohol, ether, aqueous solution not precipitated by diluted acids, alum, lead acetate or ferric salts, but is by tannin; contains carbon 50 p. c., nitrogen 18, hydrogen 7, oxygen 24, sulphur 0.5.

5. *Chondrin*.—This resembles gelatin, being from cartilages of the ribs and other non-ossifying cartilages; its aqueous solution is precipitated by alum, lead acetate, ferric salts, acetic and mineral acids, but not by tannin or mercuric chloride; used as emollient, nutritive, protective, as the basis for suppositories, pessaries, bougies, capsules, lozenges, pill-coating, etc. Differs from gelatin in containing less nitrogen, more oxygen, in precipitating with acetic and mineral acids, but not with tannin.

5. TELEOST(EÆ)-IA. Teleostean Family.

Tel-e-os'te-e. L. *teleosteus*, fr. Gr. τέλεος, complete, + οστέον, a bone; *i. e.*, has a well ossified skeleton, like ordinary fishes. This family has well-developed brain, optic nerves cross each other, but without any chiasm; heart has a non-contractile arterial bulb, fins have well-developed and distinct rays; skeleton is completely ossified, the backbone being composed of well ossified vertebræ.

Genus: 1. **Gadus.**

OLEUM MORRHUÆ. COD-LIVER OIL (OLEUM JECORIS ASELLI).

Gadus Morrhua, *Linné*, and other species. } A fixed oil from the fresh livers.

Habitat. N. Atlantic Ocean.

Syn. The Cod, Oleum Hepatis Morrhuæ, Cod Oil. Fr. Huile de Foie de Morue, Huile de Morue. Ger. Leberthran, Stockfischleberthran.

Ga'dus. L. a codfish, Gr. γάδος, same as ὄνος, L. *asellus*, a certain kind of fish.

Mor'rhu-a. L. a cod (fish), fr. *morua*, *moruta*, ult. *merula*.

ANIMAL.—The common codfish is .6–1 M. (2–3°) long, with brown or yellowish spots on the back; body is somewhat elongated and compressed, with soft, small scales, none being on the head; fins soft, three on the back, two anal and a distinct caudal; teeth irregular, pointed, in several ranks; gills large, 7-rayed.

OLEUM MORRHUÆ, COD-LIVER OIL.—Pale yellow, thin liquid, slight fishy odor, bland fishy taste, sp. gr. 0.923; near 0° C. (32° F.) separates a white granular deposit, soluble in ether, chloroform, carbon disulphide. *Tests:* 1. When standing at 0° C. (32° F.) very little or no solid fat should separate (abs. other fish oils, and many vegetable oils). 2. With sulphuric acid get deep-violet, changing to brownish-red; or 2–3 drops nitric acid + 10–15 drops of oil gives red color at point of contact, by stirring get bright-rose color, changing to lemon-yellow (dist. from seal oil, which shows no color change at first, and from other fish oils, which become at first blue, then brown-yellow, dark color, etc.). 3. Soap of pure oil is soluble in water. Should be kept in dry, well-stoppered bottles to prevent oxidation or rancidity. Dose, ʒj–4 (4–15 Cc.).

ADULTERATIONS.—With allied fish oils, also other fixed oils, rosin (soluble in alcohol), fish and paraffin oil, this latter being recognized by saponifying with potassa in alcoholic solution.

Commercial.—Codfish are abundant on the coasts of Newfoundland, Norway, Nova Scotia, New England, north of Boston, and several species of *Gadus* are used for oil, as *G. calla'rias* (Dorsch=*Morrhua america'na*). *G. carbona'rius* (Coalfish); *G. polla'chius* (Pollack); *G. merlu'ccius* (Hake), and *G. æglefi'nus* (Haddock). Fishermen in small boats do most of the catching, Dec.–March; the fish after ashore are cleaned and salted, the livers being previously reserved for oil. These are boiled with water or superheated steam to disintegrate tissue and allow the oil to separate. The entire pultaceous mass is strained, and the liquid portion soon forms into a watery under layer and an oily upper layer; this latter, being drawn off and strained, is run into butts in the cooling room; when here frozen solid it is expressed through canvas bags, the hard, yellow residue (stearin and liver *débris*) is sold for soap-making, while the oil is barrelled or bottled for market, being known as *shore, white, pale-yellow oil.* Frequently large boats remain from land weeks at a time, collecting and salting the fish, and throwing livers into barrels, where they decompose; the supernatant oil is racked off, bottled; the *débris* being thrown over or reserved; this oil is darker, less sweet than the shore oil, being known as *straits oil, brownish-yellow oil.* The remaining *débris* can be heated with steam or water, giving a black oil, of offensive odor and taste, known as *banks oil, dark-brown oil.* The oil extracting is carried on by individuals in a small way on shore, or by large factories near seat of capture and in remote places, whither livers are sent in refrigerator cars. Good quality oil can be obtained by simply boiling livers in water to a pulp, straining through canvas, subsiding, decanting, filtering.

CONSTITUENTS.—Chiefly olein (physetolein) 70 p. c., palmitin 25 p. c., little stearin, palmitic acid 4 p. c., jecoleic acid 20 p. c., $C_{19}H_{36}O_2$, theropic acid, $C_{17}H_{26}O_2$, iodine 0.001–0.002 p. c., three alkaloids—trimethylamine, C_3H_9N, aselline, $C_{25}H_{32}N_4$, morrhuine, $C_{19}H_{27}N_3$ (diuretic, diaphoretic), cholesterol 0.5–1.5 p. c., traces of chlorine, bromine, phosphorus, sulphur, 0.3 p. c. cholesterin, morrhuic acid, $C_9H_{13}NO_3$, probably butyric and acetic acids. With alcohol (90 p. c.) oil yields 3.5–6 p. c. of extract called *morrhuol,* in which active virtues reside.

PREPARATIONS.—(Unoff.) *Emulsions. Capsules.*

PROPERTIES.—Alterative, demulcent, emollient, nutrient. Owing to it already having been prepared by the liver, therefore partly elaborated, it is the most easily digested of the fats, increases red blood-corpuscles, body-weight and healthy cell formation throughout the tissues; pancreatic juice resolves it into glycerin and fatty acids, the latter unite with alkalies of the bile and intestinal juice forming soaps, the larger portion, however, is emulsionized by alkaline secretions of the intestines. It is absorbed readily by the skin, and large doses may occasion diarrhœa.

USES.—Wasting diseases, chronic phthisis, bronchitis, rheumatism, skin diseases, neuralgia, chorea, epilepsy, nerve tonic, convalescence from acute diseases, scrofula, gout, white swelling, chronic arthritis.

To take internally may disguise odor and taste: 1. Emulsion + oil of bitter-almond (1 to 250). 2. Porter ℥j (30 Cc.) + oil + plenty froth on top. 3. Orange- or lemon-peel chewed before and after taking. 4. Common salt, or a chew of salted or smoked herring before taking. 5. With soup or made into bread, jelly, etc. If oil nauseates give before each dose potassium cyanide gr. ⅛ (.008 Gm.), or lime water ʒiv (15 Cc.), or bismuth subnitrate gr. 15–30 (1–2 Gm.).

Allied Oils:

1. *Oleum Squali, Shark Oil.*—From the liver of the shark—*Squa'lus Carcha'rias;* light-yellow, limpid at −6° C. (21.2° F.).
2. *Oleum Rajæ, Ray Oil, Skate Oil.*—From livers of *Ra'ja Ba'tis.* France, Belgium; pale-yellow, said to contain more iodine than cod-liver oil.
3. *Oleum Ceti, Sperm Oil.*—From *Physe'ter macroce'phalus;* yellowish, in cold deposits spermaceti and stearin.
4. *Oleum Balænæ, Whale Oil.*—From *Balæ'na mystice'tus* and *B. austra'lis;* deposits at 10° C. (50° F.).

CLASS: **AVES.** L. pl. of *avis*, a bird, Skt. *vi*, a bird (*ovum* and *egg*). The highest vertebrated animals, with the exception of mammals. Consists of birds having a complete double circulation, hot blood, 4-chambered heart, fixed lungs, oviparous reproduction, eggs with copious (food) yolk, albumin and calcareous shell; four limbs—two front ones modified as wings; bear feathers, have a horny beak but no teeth.

6. GALLINÆ. Gallinaceous Family.

Gal-li'ne. L. *gallina*, a hen (*gallus*, a cock). This family includes the rasorial birds, as all kinds of domestic fowls and their feral relatives—turkeys, pheasants, grouse, patridges, quails, guinea fowls, mound birds (Australia), curassows, hoccos, guans, etc. These are chiefly terrestrial, polygamous, præcocial, ptilopædic, with schizognathous palate, schizorhinal nasal bones, recurved mandible, double-notched sternum, muscular gizzard, two carotids, after-shafted plumage, feet 4-toed, legs feathery, claws blunt.

GALLINÆ.

Genus: 1. **Gallus.**

VITELLUS. YOLK OF EGG.

Gallus Bankiva
var. **domesticus,** *Temminck.* } The yolk of the egg.

Habitat. Java, Cochin China, Philippines; domesticated.

Syn. The domestic Cock and Hen, Yelk of Egg. Br. Ovi Vitellus. Fr. Jaune d'Oeuf. Ger. Eidotter, Eigelb.

Gal′lus. L. a cock; *i. e.*, the classic name.

Ban′ki-va. L. *bankivus; i. e.*, after Sir Joseph Banks, English naturalist (1743-1820).

Do-mes′ti-cus. L. domesticated, belonging to the household, fr. *domus*, house.

ANIMAL.—Known as the domestic or dunghill fowl, and originated from the red jungle-fowl, to which the nearest approach we have now is the game cock. The eggs of this fowl give three pharmaceutic products—shell 10 p. c., albumin 60 p. c., yolk 30 p. c., this latter alone being official.

VITELLUS, YOLK OF EGG.—This is a viscid, yellow, or reddish-yellow, opaque, alkaline liquid—being an emulsion of oil suspended in water by albumin; coagulates by heat, and also upon the addition of alcohol; gives whitish emulsion with water; yields to ether yellow fat and separates a white mass; odorless, bland taste. Dose, 1–2 yolks.

CONSTITUENTS.—Water 48–55 p. c., vitellin 16 p. c. (a proteid related to casein, mixed with albumin), fat 30 p. c., inorganic salts 1.5 p. c. (chlorides, sulphates and phosphates of potassium, sodium, calcium, and magnesium), cholesterin 0.42 p. c., lecithin, coloring matter, lactic acid, sugar.

PREPARATION.—1. *Glyceritum Vitelli.* Glycerite of Yolk of Egg. (Syn., Glyconin, Glyconinum; Fr. Glyconine; Ger. Glyconin.)

Manufacture: Rub fresh yolk of egg 45 Gm. in a mortar, with glycerin 55 Gm., gradually added, until thoroughly mixed.

PROPERTIES AND USES.—Nutritious, laxative; jaundice, dyspepsia; chiefly in pharmacy for emulsionizing oils, dressing for burns, scalds, abrasions, to soften crusts of cutaneous eruptions; also cerumen in the ear.

Allied Products:

1. *Albumin Ovi, White of Egg.*—Weighs ʒv–6½ (20–25 Gm.). Contains water 82–88 p. c., solids 12–18 p. c., mostly albumin, little fat, sugar, extractive, ash 0.65 p. c., of which 42 p. c. is KCl and 9 p. c. NaCl, the remainder being carbonates, phosphates, sulphates of alkalies, calcium, magnesium, and iron. It is nutritious, clarifies honey, syrup, and other liquids, is an antidote to metallic poisons (mercuric chloride, copper salts, etc.).

2. *Testa Ovi, Egg Shell.*—Composed of calcium carbonate 90–97 p. c., calcium and magnesium phosphate 1–5.7 p. c.; organic matter 2–4.7 p. c. It is antacid; once popular in gravel.

CLASS: **MAMMALIA.** L. fr. *mammalis*, of the beast. The highest class of vertebrata. Distinguished by all being warm-blooded, viviparous, suckling their young by a mammary gland, nipples, breathing by lungs.

7. CETACEA. Cetaceous Family.

Se-ta′se-a. L. *cetus*, Gr. *κῆτος*, a whale; *i. e.*, pertaining or belonging to the whale. All animals of this family have pelvis and hind limbs somewhat atrophied, a fish-like body, specialized for aquatic progression, ending in a horizontal tail or flukes; short fore-limbs like fins or flippers, one at least of the digits with more than three phalanges; neck usually short; some of the cervical vertebræ anchylosed together.

Genus: 1. **Physeter.**

CETACEUM. SPERMACETI.

Physeter macrocephalus, *Linné.* } A peculiar, concrete, fatty substance.

Habitat. The Pacific and Indian Oceans.

Syn. The Sperm Whale; Fr. Blanc de Baleine, Cétine, Spermacéti, Ambre blanc. Ger. Spermaceti, Wallrath, Cetaceum, Walrat.

Phy-se′ter. L. fr. Gr. *φυσητήρ*, a blow pipe, a kind of whale; *φυσᾶ*, a pair of bellows, wind; *φυσᾶν*, blow; *i. e.*, the sperm whale has a blow-hole near the edge of the snout.

Mac-ro-ceph′a-lus. L. fr. Gr. *μακρός*, long, + *κεφαλή*, head; *i. e.*, animal has a long or large head.

ANIMAL.—Usually 18–24 M. (60–80°) long, enormous head, being often 9 M. (30°) in circumference, and composing one-third its whole length. In front of the cranium the upper jaw has a large cavity containing an oily liquid, which, being removed in buckets shortly after death congeals into a yellow mass. It is drained in suitable bags, pressed to remove oil, pressed-cake purified by melting in water, impurities skimmed off, boiled with weak potassa solution, washed with water, and allowed to congeal.

CETACEUM, SPERMACETI.—This (as thus congealed) is in white, somewhat translucent, slightly unctuous masses of scaly-crystalline fracture, pearly lustre, odorless, bland, mild taste, yellow and rancid by exposure; sp. gr. 0.945; soluble in boiling alcohol, ether, chloroform, fixed and volatile oils; insoluble in water or cold alcohol.

Impurities.—Stearic acid, which is separated by boiling in alcohol, cooling, filtering and precipitating with water, or by boiling 1 Gm. with sodium carbonate 1 Gm. in alcohol 50 Cc. and precipitating with acetic acid.

CONSTITUENTS.—Mainly cetylic alcohol, $C_{16}H_{33}OH$, combined with palmitic acid, $HC_{16}H_{31}O_2$, forming a fat, cetin (cetyl palmitate), $C_{16}H_{33}.C_{16}H_{31}O_2$, also small amounts of fats containing stearic, myristic and lauro-stearic acids.

PREPARATIONS.—1. *Ceratum Cetacei.* Spermaceti Cerate. (Syn., Emplastrum Spermatis Ceti, Ceratum Labiale Album; Fr. Cérat de Blanc de Baleine, Onguent blanc; Ger. Walrat-Cerat.)

Manufacture: Melt together spermaceti 10 Gm., white wax 35, then add olive oil 55 Gm. previously heated, stir until cool.

2. *Unguentum Aquæ Rosæ,* 12.5 p. c. Use externally.

Properties and Uses.—Lenitive, demulcent, emollient, as a basis for ointments, cerates, etc., alvine and urinary irritations. Can be given in emulsion with egg-yolk or almond oil, or powder made by rubbing down with alcohol or little almond oil.

Derivative Product:

1. *Ambra Grisea, Ambergris.*—This is a morbid excretion found in the intestines of the sperm whale, also floating on the sea. A single whale has produced 750 lbs. (340 Kg.). It is in irregular masses, brownish-gray color, with lighter and darker streaks and spots, fusible in hot water, friable in the cold, sp. gr. 0.800–0.920. Soluble in ether, fats, volatile oils, hot alcohol, insoluble in potassa solution; odor peculiar, fragrant, nearly tasteless; contains ambreïn (fatty substance resembling cholesterin) 85 p. c., balsamic extractive, little ash. Used as stimulant, antispasmodic, mostly in perfumery for fixing odor. Dose, gr. 5–15 (.3–1 Gm.).

8. PACHYDERMATA. Pachyderma(l)-tous Family.

Pak-i-der′ma-ta. L. fr. Gr. *παχύς*, thick, + *δέρμα(τ)*, skin. All animals of this family have thick skin, are non-ruminant ungulate mammals, or hoofed quadrupeds which do not chew the cud, such as elephants, hippopotamuses, swine, rhinoceroses, hyraxes, tapirs, horses, etc.

Genus: 1. **Sus.**

SUS SCROFA. THE HOG.

1. Adeps. Lard.
2. Pancreatinum. Pancreatin.
3. Pepsinum. Pepsin.

Sus scrofa, *Linné.*
1. The prepared internal fat of the abdomen, purified by washing with water, melting, straining.
2. A mixture of the enzymes (unorganized ferments) naturally existing in the pancreas of warm-blooded animals, usually obtained from fresh hog-pancreas.
3. A proteolytic ferment or enzyme from the glandular layer of fresh stomachs of healthy pigs.

Habitat. Domesticated from the wild boar and closely related forms; universal.

Syn. 1. Br. Adeps Præparatus, Axungia, Axungia Porci or Porcina, Prepared (Hog's) Lard. Fr. Axonge, Graisse de Porc, Saindoux. Ger. Adeps Suillus, Schweineschmalz. 2. Fr. Pancreatine. Ger. Pancreatin. 3. Fr. Pepsina, Pepsine. Ger. Pepsin.

Sus. L. fr. Gr. ὗς, a hog, pig; *i. e.*, the Linnean name of the genus.

Scrof′a. L. a breeding sow; *i. e.*, its classic name.

Animal.—About .6–1.3 M. (2–4°) long, .3–1 M. (1–3°) high, weighing from 15–800 lbs. (7–365 Kg.), sometimes with side tusks (long canines); color iron-gray, white, or black, with long, drooping ears and more or less elongated snout. It is very important to man for its meat, fat and entrails.

I. LARD: This fat is from the mesentery, omentum, and kidneys of the winter-killed hogs; it is deprived of blood, external membranes, cut into small pieces, and heated on water bath until melted, then strained through flannel. To make inodorous may add to each lb. (.5 Kg.) of melted lard, alum gr. 15 (1 Gm.) and salt gr. 30 (2 Gm.), boil until scum rises, remove this, strain, cool, work on slab with a stream of water to remove salts, remelt and heat until all water is dissipated. It should be kept cool in well-closed vessels, impervious to fat. It is a soft, white, unctuous solid, faint odor; non-rancid, bland taste; soluble in ether, chloroform, carbon disulphide, benzin, insoluble in water, slightly in alcohol; sp. gr. 0.932; melts at 38–40° C. (100.4–104° F.), again congealing at 30° C. (86° F.).

Impurities: Alkalies (Na_2CO_3), starch, chlorides ($NaCl$), free fatty acids, cotton-seed oil.

CONSTITUENTS.—Olein (Oleum Adipis), 50–60 p. c., palmitin, stearin.

Oleum Adipis, Lard Oil, *official.*—(Syn., Fr. Huile de Graisse; Ger. Schmalzöl, Specköl.) This fixed oil is expressed from lard at a low temperature, by which the stearin is separated from the olein. It is a colorless or pale-yellow oily liquid; peculiar odor; bland taste; sp. gr. 0.910–0.920. Begins to congeal at 50° F., and is a semi-solid, white mass at 32° F. Contains olein, palmitin, stearin. Adulterated with cotton-seed oil (causing reddish or brown color when heated with acidulated (HNO_3) alcoholic solution of silver nitrate) and paraffin oils (causing the separation of a non-saponifiable oily layer, when heated with potassa).

PREPARATIONS.—1. *Adeps Benzoinatus.* Benzoinated Lard, 98 p. c., + benzoin 2 p. c. See page 438.

2. *Ceratum.* Cerate. (Syn., Ceratum Simplex (Adipis); Fr. Cérat simple; Ger. Einfaches Cerat, Wachssalbe.)

Manufacture: Melt together lard 70 Gm. white wax 30 Gm., stir the mixture constantly until cool.

3. *Unguentum.* Ointment. (Syn., Unguentum Simplex (Adipis); Fr. Pommade simple; Ger. Wachssalbe.)

Manufacture: Melt yellow wax 20 Gm., to this gradually add lard 80 Gm., stir the mixture constantly until cool.

4. *Numerous Cerates* and *Ointments.* Mentioned under the several drugs.

PROPERTIES AND USES.—Lard is emollient. Employed mostly externally as a basis for ointments, cerates, and to preserve softness of poultices. The benzo(in)ated lard does not become rancid quickly by exposure, consequently this property and its odor particularly commend it.

II. PANCREATIN (Zymine): This can be extracted similarly to pepsin by macerating the finely cut up fresh pancreas (sweet-breads) in acidulated (HCl) water, and separating with sodium chloride, or can be mixed with cold water, kneaded for an hour, filtered through flannel, and equal volume of alcohol added; the precipitate is drained, dried on trays at 40° C. (104° F.), then powdered. If use water saturated with chloroform, decomposition will be greatly retarded; may also rub up with sugar of milk without heat, which will keep dry and prevent decomposition. It is a yellowish or grayish-white, amorphous powder, peculiar odor, meat-like taste; soluble in water, insoluble in alcohol; acts only in alkaline solution. It converts albuminoids to peptones (*trypsin*), starch to sugar (*amylopsin*), emulsifies fats (*steapsin*), coagulates milk (*renfer*); rendered inert with mineral acids. *Test:* 5 gr. (.3 Gm.) should emulsify cod-liver oil ʒj (4 Cc.). Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—It was first used in medicine for its emulsifying properties, hence of service as a ferment in dyspepsia and in the pre-digestion of food. Useful to assist the digestion of infants, invalids, old persons, and those prostrated by fever or exhaustion. Thus to peptonize or pre-digest, take pancreatin gr. 5 (.3 Gm.), sodium bicarbonate gr. 20 (1.3 Gm.), warm water ℥j (30 Cc.); when dissolved put into warm milk Oj (.5 L.) and keep temperature 43° C. (110° F.), for an hour.

III. PEPSIN: This can be made by several processes (yielding two kinds—*precipitated* and *scale* or *soluble*), each producing pepsin of different digestive strength. The original method consisted in chopping up finely the inside mucous membrane of the pig's stomach and macerating it in acidulated (HCl) water for several days, the liquid portion is strained off, and to it sodium chloride is added; this precipitates the pepsin which, floating to the surface, is skimmed off, pressed and dried. A more modern method employs sodium sulphate (instead of sodium chloride), which together with peptone, is removed by dialysis, then residual solution concentrated and dried on glass plates. It is a fine white or yellowish amorphous powder, or in yellowish, transparent or translucent grains or scales, free from offensive odor, mildly acidulous or saline taste, bitter, hygroscopic; soluble in 100 parts water, with opalescence, more soluble in acidulated (HCl) water, insoluble in alcohol, chloroform, ether; it converts nitrogenous food (proteids—albumin, casein, fibrin, muscle) into albumoses and finally to soluble peptones; acts only in acid solution, but when acid solutions are heated to 100° C. (212° F.), they lose all proteolytic power, becoming milky or with precipitate; alcohol, alkalies and heat destroy its power. *Test:* Should be capable of digesting not less than 3,000 times its own weight of freshly coagulated and disintegrated egg albumin, when tested by the U. S. P. process. When pepsin of a higher digestive power is to be reduced, sugar of milk should be employed for the purpose. Dose, gr. 5–30 (.3–2 Gm.).

PREPARATIONS.—1. *Pepsinum Saccharatum.* Saccharated Pepsin. *Manufacture:* Triturate pepsin 10 Gm. with sugar of milk 90 Gm. to a fine, uniform powder. *Test:* Should digest 300 times its own weight of freshly coagulated and disintegrated egg albumin. Dose, gr. 5–60 (.3–4 Gm.).

Unoff. Preps.: Essence, 4 p. c., *Liquid*, 4 p. c., *Glycerite*, 8.5 p. c., *Wine*, *Aromatic Liquid*. Dose, each, ʒj–4 (4–15 Cc.).

PROPERTIES AND USES.—As a ferment to assist gastric digestion in persons having deficient secretion of gastric juice, in old persons during convalescence from long illness, cancer of stomach, diarrhœa, diabetes; does not aid digestion of fats or carbohydrates. Should be given after meals, and followed half hour afterward by dose of hydrochloric acid.

Allied Products:

1. *Diastase.*—Amylolytic ferment from the infusion of malt (barley, oats, wheat, potato), by adding a little alcohol to overcome viscidity, coagulate albumin, etc., filtering and adding alcohol sufficient to precipitate the diastase; yield .2 p. c. ' It is a white powder, tasteless, soluble in water, insoluble in alcohol; 1 part should convert 2,000 of starch into dextrin and maltose. *Taka-Diastase* is a kindred ferment resulting from the action of a Fungus upon steamed rice. It is yellowish-white powder, hygroscopic, nearly tasteless, soluble in water; claimed to convert 100 times its own weight of starch into glucose within ten minutes. Dose, gr. 2–5 (.13–.3 Gm.).

2. *Papayotin.*—Albuminous ferment from the fruit of the melon tree or Papaw (*Ca′rica Papa′ya*). Tropical America. Tree 6 M. (20°) high, stem 30 Cm. (12′) thick, fruit approximates the size of one's head, and contains an acrid, astringent, bitter, milky juice, which soon separates into a coagulum and aqueous liquid, from which latter papayotin is precipitated upon the addition of alcohol. It is a whitish, hygroscopic powder, inodorous, tasteless, soluble in water, glycerin, active in neutral, acid, but more so in alkaline solutions; it converts starch into maltose, albuminoids into peptones, and emulsifies fats; should digest 200 times its own weight. Papain, Papoid, Caroid, etc., are but weaker forms. Dose, gr. 2–5 (.13–.3 Gm.).

3. *Ingluvin.*—This is claimed to be a bitter principle contained in the fowl's gizzard. Dose, gr. 5–15 (.3–1 Gm.).

9. RUMINANTIA. Ruminant Family.

Ru-mi-nan′shi-a. L. fr. *ruminan(t)s*, ruminating, chewing the cud. All animals of this order (bos, camel, deer, neat cattle, sheep, etc.) are hoofed quadrupeds, cloven-footed, even-toed, with four stomachs, or one with four divisions. Food being slightly masticated goes to No. 1 stomach, where it is ground finer, now passes to No. 2, where it is formed into balls, which come back to the mouth and are chewed over again, constituting the cud; thence it goes to Nos. 3 and 4 stomachs, where it is digested and assimilated.

Genera: 1. **Moschus.** 2. **Ovis.** 3. **Bos.**

MOSCHUS. MUSK.

Moschus moschiferus, *Linné.* } The dried secretion from the male preputial follicles.

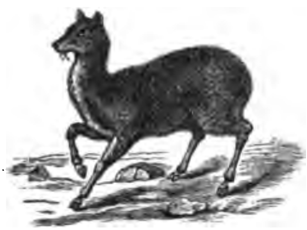
Habitat. Central Asia, from India to Siberia.
Syn. Fr. Musc. Ger. Moschus, Bisam.

RUMINANTIA.

Mos′chus. L. musk. Gr. *μόσχος*, fr. Skt. *mushka*, testicle, orig. a little mouse.
Mos-chif′e-rus. L. *moschus*, musk, +*ferre*, to bear; *i. e.*, musk-producing.

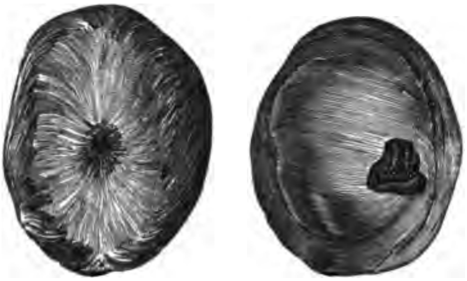
Animal.—The musk deer resembles closely our own deer in shape, size, etc.; it, however, has no horns but a tusk on each side. It is 1 M. (3°) long, .6 M. (2°) high, with haunches higher than shoulders; from upper jaw on either side the canines project downward two inches out of the mouth, forming tusks curved backward, which serve in extracting roots, etc., for food; ears long, narrow, hair undulated, strong, elastic, iron-gray color, whitish toward root, blackish near apex. Secretion (musk), occurs in irregular crumbly, unctuous grains, dark-reddish-brown, odor peculiar, penetrating, persistent; taste bitterish; it is contained in roundish sacs (pods, pouches) 5–7.5 Cm. (2–3′) long, 2.5–5 Cm. (1–2′) broad, one side (upper) flat with smooth membrane, the other (under) convex and covered with stiff, appressed, grayish hairs, concentrically arranged around two orifices near the centre. About 10 p. c. soluble in alcohol, forming a brownish-yellow tincture becoming turbid by adding water; 50 p. c. soluble in water, forming deep-brown solution, faintly acid, strongly odorous, when burnt get urine odor, grayish ash. *Solvents:* diluted alcohol; ether; hot water partially. Dose, gr. 1–10 (.06–.6 Gm.).

Fig. 410.



Musk deer.

Fig. 411.



Chinese musk sac; *a*, lower surface; *b*, upper surface.

Adulterations.—1. With artificial musk bags made of hairy skin and filled with foreign substances. These possess none of the characteristics belonging to the true bag as previously described. 2. The natural sacs are often opened and the secretion in part or whole abstracted and refilled with dried blood, resin, lead, sand, iron filings, hair, bird dung, wax, storax, benzoin, asphaltum, artificial musk, etc. In these the sewed up seam will at once excite suspicion, and lead to testing the contents.

Commercial.—Musk is derived alone from male animals, being secreted in a projecting hairy sac between the umbilicus and prepuce, it has anteriorly a small hairy orifice, and posteriorly a furrow corresponding with the opening of the prepuce; internally it is lined by a smooth membrane, much convoluted to form incomplete partitions, which secretes the musk. A strong adult animal yields ʒij–6 (8–24 Gm.) of this secretion, which is a brown, thickish liquid, but milky in the young deer. This musk deer inhabits the pine forests of the

Himalayas, 900–4,200 M. (3,000–14,000°) elevation, from India to Siberia to Thibet, seeking the inaccessible snowy recesses and cliffs. It is timid, active, fleet-footed, hiding away by day, searching for food at night; it is hunted for the hides, secretion, etc., and although abundant very few are taken, owing to their habits and apparent intelligence, and then only by snares, pitfalls, or shooting. When dead the sac is at once cut off, dried by pressing against heated stones, and sent into market. There are several varieties:

1. *Chinese, Thibet, Tonquin.*—This is the best, and while it is claimed to come from Tonquin, much is obtained from Yun-Nan in S. China, and shipped via Shanghai. Some enters commerce via Calcutta, in lead-lined boxes holding 25 sacs, each wrapped carefully in paper; these sacs are nearer round than the others.

2. *Siberian, Russian.*—This comes via St. Petersburg, and is sometimes scarcely inferior to Chinese, but generally weaker, with more fetid odor and ammoniacal smell. When this is in flat, oval sacs, which is its usual form, and has thin, light hairs, it is called *Cabardine musk.*

3. *Bucharian* and *Assam.*—This is in small sacs, often with portions of hide adhering; seldom reaches our market.

4. *Artificial Musk.*—This is the trinitro-isobutyl-methyl-benzol, and is obtained by acting on tertiary butyltoluene with nitric and sulphuric acids, then heating for eight hours, or by treating rectified oil of amber with fuming nitric acid. It is a brown, resinous mass, capable of being powdered, of a musk-like odor, which is quickly lost on exposure, and often sold under the name of *Canton musk.* The homologues of isobutylxylol have an analogous odor.

CONSTITUENTS.—Ammonia, an acid, cholesterin, fat, wax, gelatinous and albuminous principles, ash 8 p. c. = mostly NH_4, Ca, K—chlorides. The odorous principle has not been isolated; this is so powerful that a few grains, well protected, will impregnate a room for years, without any material loss of weight. Also 1 part will saturate strongly 3,000 parts of an inodorous powder. This odor, however, can be removed by triturating with camphor, hydrocyanic acid, ergot, fennel or oily seeds, or by long drying over sulphuric acid, which odor returns again upon absorbing moisture. The German Pharmacopœia requires musk dried by this last process. Alkalies render musk more soluble and the odor more pronounced.

PREPARATIONS.—1. *Tinctura Moschi.* Tincture of Musk. (Syn., Fr. Teinture de Musc; Ger. Moschustinktur.)

Manufacture: 5 p. c. Macerate for seven days 5 Gm. in diluted alcohol q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

Unoff. Preps.: Pill (Pilula). Enema. Emulsion. Suppositories.

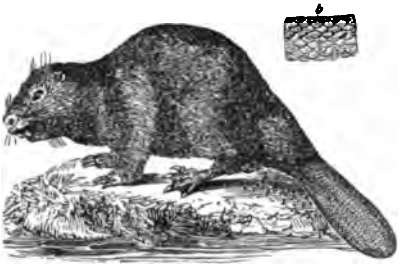
PROPERTIES.—Antispasmodic, nervine, anodyne, diffusible stimulant, aphrodisiac—similar to valerian, asafetida, camphor, ammonia. Acts directly on the heart and nervous system, producing alcoholic symptoms, stimulates respiratory centre; may cause headache, nausea.

USES.—Typhoid fever, typhus and eruptive fevers, pneumonia, infantile convulsions, hiccough, pharyngeal spasms, spasmodic croup or cough, whooping-cough, vomiting, colic, hysterical convulsions, tetanus, delirium tremens, rheumatism, cholera infantum, laryngismus stridulus; externally in plaster for muscular rheumatism, sprains, etc.

Allied Animals:

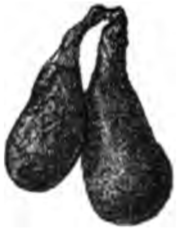
1. *Ca'stor Fi'ber, Castoreum, Castor, Beaver.*—Rodentia. A peculiar concrete substance from the male and female preputial follicles, official, 1820–1880. Canada, Russia. Beaver is about .6–.8 M. (2–2½°) long; tail 25–30 Cm. (10–12′) long, 7.5–10 Cm. (3–4′) wide, flattened, hairy at base, scaly at end; head like a rat's; has no canines but 2 incisors, 4 molars all around for gnawing; hair brownish. The American or Canadian is smaller, with darker fur, follicles weigh 1–4 ozs. (.03–.12 Kg.) and are mostly used. Russian or Siberian has follicles pyriform, 2–8 ozs. (.06–.24 Kg.); odor more agreeable, 7.5 Cm. (3′) long, club-shaped, in pairs, wrinkled, brown; contents brown, hard, friable. Alcohol dissolves one-half, giving brown tincture, turbid by adding water, clarified by ammonia. Contains volatile oil, having carbolic acid 1–2 p. c., resinous substance (bitter) 14–58 p. c., castorin, salicin, cholesterin, ash 3.5 p. c. Used as stimulant, antispasmodic, emmenagogue, for hysteria, fevers, epilepsy, typhoid, amenorrhœa in decoction, tincture. Dose, gr. 10–30 (.6–2 Gm.). It is weaker than musk, and no better than valerian, camphor, ammonia, ether, etc. It is adulterated with blood, resins, minerals, calcium carbonate, goat scrotums, etc., sometimes to 50 p. c. The oil sacs furnish our once official *Axungia Castoris.*

FIG. 412.



Castor Fiber; *b*, scales of the tail.

FIG. 413.



Castor follicles; one-fourth natural size.

2. *Ce'rvus E'laphus, Cornu Cervi, Stag's Horn, Hart's Horn.*—The horn of the stag, a species of deer, official, 1820–1840. The hard, bony horns yield by boiling with water a transparent, colorless, inodorous jelly, and then incineration (of cleaned bones) gives pure calcium phosphate, which was mixed with antimony sulphuret and subjected to white heat, yielding antimony oxide and calcium phosphate; as such was a compound of our first-made antimonial or James' powder, U. S. P.

3. *Anti'lope Do'rcas.*—N. Africa. Deer-like, ruminant animal, whose globular excrements have strong musk-odor, for which it is used in perfumery. *Hy'rax cape'nsis, Hyraceum.* S. Africa. The

dry excrements of the badger or klipdas, a mammal .5 M. (18′) long, black. When hot has castor oil odor; partly soluble in water, less so in alcohol, ether.

4. *Cive′tta* and *Zibe′thum, Civet.*—Animal .6–1 M. (2–3°) long, .3 M. (1°) high, unctuous secretion in the pouch between anus and genitals of both sexes of *Vive′rra Ci′vetta* and *V. Zibe′tha.* Africa, S. Asia. These are raised for secretions, which are removed by ladles; it is at first yellow, then dark-brown. Like musk medicinally, but mostly used in perfumery.

OVIS ARIES. THE SHEEP.

1. Sevum. Suet (Mutton Suet).
2. Adeps Lanæ Hydrosus. Hydrous Wool-Fat.

Ovis Aries, *Linné.*
1. The internal fat of the abdomen, purified by melting and straining.
2. The purified fat of the wool, mixed with not more than 30 p. c. of water.

Habitat. Domesticated, and form a variety from either the Siberian (*Ovis Ammon*), or S. Europe sheep (*Ovis Musimon*).

Syn. 1. Br. Sevum Præparatum. Fr. Suif de Mouton, Graisse de Mouton. Ger. Sebum Ovile (Ovillum), Talg, Hammeltalg. 2. Lanolinum, Lanolin (L. *lana*, wool, + *oleum*, oil, + *in*), Agnin, Oesipus, Oesipum, Woolfat. Ger. Wollfett.

O′vis. L. sheep, fr. Gr. *όις*, a sheep from which comes our ewe; *i. e.*, original name.

A′ri-es. L. a ram, fr. OE. *ares; i. e.*, the original name for the male species.

Animal.—This is one of the most useful animals to man. The male is a ram, the female an ewe, and the young a lamb; the flesh of the latter is called lamb, that of the adult mutton; the fleece is wool, a great component of our warm clothing, the prepared hide is the useful sheepskin; the entrails furnish sausage skins, and when dried (catgut) are twisted into musical instrument strings. In addition to all these we have the two official products as above named. There are many varieties of sheep, but the most important are: 1. Leicester. 2. Cotswold. 3. Southdown. 4. Cheviot. 5. Astrakhan. 6. Cretan. 7. Merino.

I. Suet: This is taken chiefly from around the kidneys, and prepared by cutting it into pieces, melting carefully and straining through linen or flannel; can also boil it in water, when it floats to the surface, leaving the water and impurities as a substrata. It is a white solid fat, slight odor, bland taste, becoming rancid by age; melts at 46° C. (115° F.), congeals at 39° C. (102° F.); soluble in 60 parts ether, 2 parts benzin, insoluble in water, cold alcohol. It should be kept in well-closed vessels impervious to fat, and not used when rancid.

Constituents.—Stearin and palmitin 70 p. c., olein 30 p. c., hircin a trace.

Preparation.—1. *Unguentum Hydrargyri,* 23 p. c. Use externally.

Properties and Uses.—Lenitive, when rancid an irritant. Chiefly in cerates, ointments, plasters, as it is thicker than lard, for dressing blisters, excoriated surfaces, chapped hands, etc.

Allied Fat:

1. *Sevum Bovinum, Beef Tallow.*—This is the internal fat of *Bos Taurus;* it is similar to the preceding, only has a slightly different odor; melts at 40° C. (104° F.), and contains more palmitin, and no hircin.

II. Hydrous wool-fat: This is prepared from the sheep's wool, which contains about 45 p. c. of its weight in fat. This must be removed before the wool can be utilized in making fabrics, which is accomplished by treating wool with a weak solution of soda to produce an emulsion or soap; this creamy mixture can be dissolved in ether, alcohol or benzin, or put into a centrifugal machine, which separates it into an upper layer of cholesterin and fats, and a lower layer—soap solution of the impure fatty acids; the upper layer is treated with calcium chloride, giving a precipitate of crude lanolin and calcium soap; by repeated melting and washing this, and finally dissolving in acetone, we get pure anhydrous lanolin (*Adeps Lanæ*). Into this is now kneaded water 30 p. c., which gives us the official product. It is a yellowish-white, ointment-like mass, faint peculiar odor, sp. gr. 0.973, melting at 40° C. (104° F.), insoluble in water, but miscible with twice its weight without losing its ointment-like character, turbid with chloroform, ether.

Impurities: Alkalies, free fatty acids, nitrogenous animal matter.

Constituents.—Cholesterin, $C_{26}H_{43}OH$, isocholesterin, cerylic, carnaubic, lanolinic and other alcohols, esters of lanopalmitic, myristic, carnaubic, oleic, and other acids, ash 0.3 p. c.

Properties and Uses.—Lenitive. It is more quickly absorbed by the skin than most fats, hence a good base for mercury and other medicines to be administered by inunction. Soothing to the skin and a good base for ointments.

Derivative Products:

1. *Thyroideum Siccum, Dry Thyroid.*—The thyroid gland of the sheep is located about the two first tracheal rings; it is two-lobed, joined by a narrow band (isthmus), in front of the tracheæ, brownish-red, weighing about ℥ij (8 Gm.). After the removal of all fat, connective tissue, etc., the gland is cut across, and those rejected that are abnormal, hypertrophied, or contain cysts. The select ones are now minced, dried at 35° C. (95° F.), fat removed by benzin, then again dried. It is light-dull-brown powder, odor and taste meat-like, free of putrescence, becomes damp and deteriorates on exposure to air. Contains thyroiodin, iodo-globulin. The extract (Extractum Thyroidei) is made with glycerin, four glands being in each ounce (30 Cc.), this solution is heated with strong phosphoric acid, poured into lime water, and precipitate dried. The solution (Liquor Thyroidei) is also made with glycerin, and preserved with 0.5 p. c. aqueous solution carbolic acid; it is a pinkish, turbid liquid, without any putrescent odor, minims 100 (6 Cc.) contain one gland. Used in myxœdema, cretinism, obesity, and when persisted in may produce *thyroidism*—headache, dizziness, body pains, loss of weight, shortness of breath, weak and rapid pulse, involving nervous and circulatory (heart) systems. Dose, gr. 5–10 (.3–.6 Gm.).

BOS TAURUS. THE OX AND COW.

1. Fel Bovis. Oxgall (Fel Tauri).
2. Saccharum Lactis. Sugar of Milk, $C_{12}H_{22}O_{11} + H_2O$.

Bos Taurus, *Linné.* } 1. The fresh bile.
2. Peculiar crystalline sugar from the whey of cow's milk.

Habitat. Domesticated; universal.

Syn. 1. Fel Bovinum, Bilis Bubula, Ox-bile. Fr. Bile (Fiel) de Bœuf. Ger. Ochsengalle, Rindsgalle. 2. Lactose, Milk-sugar. Fr. Sucre de Lait. Lactine. Ger. Milchzucker.

Bos. L. *bos, bovis,* fr. Gr. *βοῦς*, an ox; *i. e.*, its classic name.

Tau'rus. L. fr. Gr. *ταῦρος*, a bull, ox; *i. e.*, its classic name.

Animal.—Large, 2–3 M. (6–10°) long, 1–1.6 M. (3–5°) high, head low upon a short neck, legs relatively short, hoofs broad, muffle naked, horns unbranched, tail tufted at the end, with inguinal teats.

I. Bile: This is separated by liver in the gall-bladder; it is a brownish or dark-green viscid liquid, peculiar, unpleasant odor, disagreeable, bitter taste, sp. gr. 1.020; with sulphuric acid gives deep-red or purple color; add alcohol to precipitate mucilaginous matter, filter, evaporate off alcohol and then it readily resists putrefaction. Dose, inspissated bile, gr. 5–15 (.3–1 Gm.).

Constituents.—Water 85–90 p. c., solids 10 p. c. = mucilage (precipitated by 2 vols. alcohol), bilirubin (cholepyrrhin), $C_{16}H_{13}N_2O_3$, and other coloring matters, cholesterin, $C_{26}H_{44}O$, lecithin, urea, and salts, among which are the sodium salts of two bitter acids, glycocholic (cholic) and taurocholic (choleic), both when boiled with alkalies yield cholic (cholalic) acid, and the former glycocoll, the latter taurin.

Preparation.—1. *Fel Bovis Purificatum.* Purified Oxgall. (Syn., Extractum Fellis Bovini; Fr. Fiel de Bœuf purifiée; Ger. Fel Tauri Depuratum, Gereinigte Ochsengalle.)

Manufacture: Evaporate fresh oxgall 300 Gm. to 100 Gm., add alcohol 100 Cc., after 3–4 days decant, filter, distil off alcohol, evaporate. It is a yellowish-green soft solid, peculiar odor, sweet, bitter taste, soluble in water, alcohol. Should remain clear with equal quantity of alcohol (evidence of purity). Dose, gr. 5–15 (.3–1 Gm.).

Properties and Uses.—Tonic, laxative, cholagogue, antiseptic, vermifuge; constipation, especially when feces pale color, dyspepsia, jaundice; whenever biliary secretion is deficient, locally in glandular enlargements.

II. Milk-sugar: This is found only in mammals' milk, usually to the extent of about 5 p. c.; obtained mostly in Switzerland, Bavaria, etc., from whey of cheese-making; the butter and casein are removed, the latter by allowing time for oxidation and generation of lactic acid, or by adding to skimmed-milk diluted sulphuric acid, the resulting whey is evaporated to $\frac{1}{15}$ original bulk, when it is a brown, viscid, sweetly saline mass; this is put into tubs, and in 1–2 days sugar crystallizes in bright-yellow granules = *sugar sand,* which can be decolorized by charcoal. Occurs in hard crystalline masses, sp. gr. 1.525, yielding a gritty white powder, odorless, faintly sweet taste, soluble in 6 parts water, 1 boiling water. *Tests:* 1. Syrup boiled with soda T. S. turns yellowish then brownish-red, to this add few drops copper sulphate T. S. getting brick-red precipitate, thus reducing cuprous oxide from alkaline solution of cupric oxide. 2. With sulphuric acid get greenish or reddish but no brown or black within half hour (abs. cane sugar). 3. On boiling with dilute acids splits into dextrose and galactose, $C_6H_{12}O_6$; on heating caramel is obtained. Dose, ℥j–5 (30–150 Gm.) per die, in powder or syrup.

PREPARATIONS.—A great number, chiefly as a diluent.

PROPERTIES AND USES.—Diuretic in cardiac dropsy. As a diet in consumption and other wasting-diseases. In pharmacy for triturations, powders, etc., for diluent, as it is much harder than cane sugar, hence aids in comminuting medicines more finely; it is less sweet than cane sugar, and not so apt to ferment in the stomach or bowels, hence good in infantile foods, certain forms of dyspepsia, indigestion, etc.

Derivative Products:

1. *Butyrum, Butter.*—This is obtained by churning the cream rising upon cow's milk. It is soft, yellow, neutral (if acid, due to free butyric acid), sp. gr. 0.930, melts at 32° C. (89.6° F.), congeals at 23° C. (73° F.); odor delicate, sweet; taste bland. Contains olein 30 p. c., palmitin and stearin 68 p. c., glycerides of butyric, capronic, caprylic, and caprinic acids 2 p. c. When employed in medicine should be without salt and casein by melting it in warm water and decanting the clear liquid. If 100 parts be saponified by alkali, and soap decomposed by hydrochloric acid, get fat acids, which, after washing (to remove 8 p. c. volatile fat acids) and drying have 85–88 parts; other fats yield about 95 p. c. of fat acids insoluble in water. Used as demulcent, lenitive, ointments, dietetic.

2. *Sanguis, Blood.*—This, the arterial fluid of the ox, is red, opaque, peculiar odor, sp. gr. 1.050; consists of blood-corpuscles in suspension; coagulates on exposure, separating the clot (cruor) from the liquid (serum). Contains water 78 p. c., albumin 7, fibrin 0.4 p. c., corpuscles, hæmoglobin, etc., 13 p. c., salts 0.9 p. c. = alkalies, calcium, and magnesium chlorides, phosphates, sulphates; the serum contains 10 p. c. solids—8 p. c. of which are albuminoids. When evaporated have extractum or pulvis sanguinis. Used as restorative. Dose, gr. 5–15 (.3–1 Gm.).

3. *Os, Bone.*—The skeleton of vertebrate animals, official, 1850–1880. These are solid, white, smooth, lamellated texture, internally porous, consisting of a cellular gelatinous tissue filled with calcareous deposits (earthy salts). It is insoluble in water, soluble in hydrochloric acid with effervescence, leaving behind a gelatinous mass (ossein); contains calcium phosphate 40–67 p. c., calcium carbonate 5–10 p. c., magnesium phosphate 1–2 p. c., calcium fluoride 1 p. c., traces of Si, Fe, Mn, NaCl. Ossein yields gelatin when boiled with water; when dry distilled get Dippel's animal oil, containing pyridine,

picoline and other bases. Used for preparing animal charcoal (bone-black), phosphates, superphosphates (manure).

Related Products:

1. *Diphtheria Antitoxin.*—The diphtheritic bacillus when growing in the body causes the formation of toxins, albumoses, an organic acid, and a substance called antitoxin, which is found in the blood. Frequently the quantity of antitoxin is quite sufficient to antagonize the toxin produced, thereby insuring life, on the other hand additional antitoxin may have to be administered in order to save the patient. A culture of diphtheria bacilli can be accomplished on meat broth in a flask, to which has been added 0.5 p. c. sodium chloride and 2 p. c. peptone. After several weeks the bacilli are filtered off, when the remaining fluid should contain considerable diphtheria toxin of sufficient strength that ♏jss (.1 Cc.) will kill a guinea-pig. Now of this ♏iij–15 (.2–1 Cc.) is injected into the vein of a young, healthy horse, which produces slight symptoms; these having passed away, a larger dose is administered, and so repeated until ℥iij (90 Cc.) are given at each injection, thereby insuring a large amount of antitoxin in the blood serum. After several months 1 gallon (4 L.) of blood is taken from the horse, in a sterilized vessel, then allowed to coagulate, and the antitoxic serum placed into sterilized bottles, with some antiseptic (carbolic acid), and hermetically sealed. This antitoxic serum should always be administered with a special syringe, between the shoulders, or on the side of the abdomen, having had the skin washed with an antiseptic prior to the injection. It is better to use small doses of concentrated rather than large doses of diluted serum, and within the first twenty-four hours the patient should receive 2,000–4,000 normal units, divided into two or three doses, and each day thereafter the same quantity until improvement is assured. Every ♏xv (1 Cc.) of serum should contain at least 100 normal units. Erythematous rash, painful and swollen joints, irregular temperature, etc., may follow several weeks after its use.

2. *Streptococcus Antitoxin.*—This serum is prepared similarly to the preceding, using, however, several rabbits as well as finally the horse, for increasing the virulence, and not bleeding the latter until a year after the first inoculation. These streptococci produce the severe forms of septicæmia in puerperium, after injuries, operations, in erysipelas, scarlet fever, etc. Dose, ʒijss–5 (10–20 Cc.).

3. *Hydrophobia Antidote.*—While this is not a true antitoxin, it is prepared somewhat similarly; thus a rabbit is inoculated from the spinal cord of an animal having died of hydrophobia; from this rabbit others are inoculated in a series until the spinal cord contains a virus whose incubation period is seven days. The patient is first inoculated with a rabbit's spinal cord of low degree of virulence, the next day with one of higher degree, and so increased for several weeks, when one is usually immuned, provided treatment was begun soon after the bite of rabid dog.

RECAPITULATION No. 12.

Class and family. 1. Latin official name. 2. Eng. official name.	Zoölogic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Class *Insecta.* Family *Hemiptera.* 1. Coccus. 2. Cochineal.	Coccus cacti.	The dried female insect.	Mexico, C. America.	Carminic acid, coccerin, fat.	Tinct. card. comp.	Stimulant, diuretic, antispasmodic.	Whooping-cough, neuralgia, for coloring preparations.	1-15 (.06-1 Gm.)
Class *Insecta.* Family *Coleoptera.* 1. Cantharis. 2. Cantharides (Spanish Flies).	Cantharis vesicatoria.	The beetle.	S. and C. Europe, W. Asia.	Cantharidin, fat, odorous compound, extractives, salts.	Cerate, plaster pitch and canth., collodion canth., tincture.	Diuretic, aphrodisiac, emmenagogue, rubefacient, acrid poison.	Dropsy, bronchitis, bladder debility, gleet, diabetes, amenorrhœa, ulcers, brain congestion, pleurisy, dysmenorrhœa, rheumatism, tetanus, apoplexy, meningitis.	⅙-1 (.01-.06 Gm.)
Class *Insecta.* Family *Hymenoptera.* 1. Mel. 2. Honey.	Apis mellifica.	A saccharine secretion.	N. America, Europe.	Grape sugar, wax, vol. oil, proteids, mucilage, formic acid, coloring.	Clarified honey, mel rosæ, confection rosæ.	Demulcent, laxative, stimulant, nutritive.	Aphthæ, thrush, boils, fissures.	Ad libitum.
1. Cera Flava. 2. Yellow Wax.	....	A concrete substance.	....	Hydrocarbons, cerin, myricin.	Resin, cerate, canthar. cerate, res. plaster, ointment, ointment of tar, white wax.	Protective, demulcent, emollient.	Plasters, cerates, ointments, diarrhœa, neuralgia, gleet, protective.	Externally.
Class *Pisces.* Family *Sturiones.* 1. Ichthyocolla. 2. Isinglass.	Acipenser Huso.	The swimming bladder.	Caspian and Black Seas.	Gelatin, insoluble membrane.	Plaster.	Slightly nutritious, emollient.	Chronic bowel trouble, protection to cuts, abrasions, skin eruptions.	Ad libitum.
Class *Pisces.* Family *Teleostia.* 1. Oleum Morrhuæ. 2. Cod-Liver Oil.	Gradus Morrhua.	A fixed oil.	N. Atlantic Ocean.	Olein, palmitin, stearin, iodine, aselline, morrhuine, chlorine, bromine, phosphorus.	....	Alterative, demulcent, nutrient.	Wasting diseases, phthisis, bronchitis, rheumatism, skin trouble, diarrhœa, nerve tonic, scrofula, arthritis, gout.	ʒj-4 (4-15 Cc.)

RECAPITULATION No. 12.—(*Continued.*)

Class and family. 1. Latin official name. 2. Eng. official name.	Zoölogic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses, Grains.
Class *Aves.* Family *Gallinæ.* 1. Vitellus. 2. Yolk of Egg.	Gallus Bankiva var. domesticus.	The yolk of the egg.	Java, Cochin China.	Vitellin, albumin, fat, cholesterin, lecithin, lactic acid, coloring, salts.	Glycerite.	Nutritious, laxative.	Jaundice, dyspepsia, burn, abrasions, skin eruptions, emulsifier.	1-2
Class *Mammalia.* Family *Cetacea.* 1. Cetaceum. 2. Spermaceti.	Physeter macrocephalus.	A concrete fat.	Pacific and Indian Oceans.	Cetylic alcohol combined with palmitic acid.	Cerate, cold cream.	Lenitive, demulcent, emollient.	Base of cerates, ointments, etc., urinary irritation.	
Class *Mammalia.* Family *Pachydermata.* 1. Adeps. 2. Lard.	Sus scrofa.	The internal fat.	Universal.	Olein, palmitin, starch.	Benz. lard, cerate, ointment, *Oil:* many cerates, ointments.	Emollient poultices.	To protect surfaces.	
1. Pancreatinum. 2. Pancreatin.	....	Unorganized ferment.	....	....	....	Ferment.	Dyspepsia, indigestion.	5-15 (.3-1 Gm.)
1. Pepsinum. 2. Pepsin.	....	Unorganized ferment.	....	....	Saccharated pepsin.	Ferment.	Dyspepsia, indigestion, diarrhœa.	5-30 (.3-2 Gm.)
Class *Mammalia.* Family *Ruminantia.* 1. Moschus. 2. Musk.	Moschus moschiferus.	The dried secretion from male preputial follicles.	C. Asia.	Ammonia, acid, fat, cholesterin, gelatinous and albuminous principles.	Tincture.	Antispasmodic, nervine, anodyne, stimulant, aphrodisiac.	Typhoid, pneumonia, convulsions, hiccough, croup, whooping-cough, nausea, colic, hysterics, tetanus, rheumatism, sprains.	1-10 (.06-.6 Gm.
1. Sevum. 2. Suet (Mutton Suet).	Ovis Aries.	The internal fat.	Universal.	Stearin, palmitin, olein, hircin.	Ointment of mercury.	Lenitive.	Dressing blisters, excoriated surfaces, chapped hands.	Externally.
1. Adeps Lanæ Hydrosus. 2. Hydrous Wool Fat.	....	The purified fat of the wool.	....	Cholesterin, ethers of stearic, palmitic, oleic, valerianic acids.				
1. Fel Bovis. 2. Oxgall (Fel Tauri).	Bos Taurus.	The fresh bile.	Universal.	Bilirubin, cholesterin, lecithin, colic and choleic acids, mucilage.	Purified oxgall.	Tonic, laxative, cholagogue, antiseptic, vermifuge.	Constipation, dyspepsia, jaundice, glandular enlargements.	Grains. 5-15 (.3-1 Gm.)

PART III.

INORGANIC DRUGS FROM THE MINERAL KINGDOM.

I. METALLOIDS AND THEIR COMPOUNDS.

HYDROGEN AND OXYGEN.

$H^{i} = 1.$ $O^{ii} = 16.$

THE two elements, hydrogen (Gr. *ὕδωρ*, water, + *γενής*, producing) and oxygen (Gr. *ὀξύς*, acid, sharp, + *γενής*, producing), in their separate state, are of little service to medicine, but when combined one with the other, or either of these with other elements, we come in possession of an almost endless list of agents—many being of the utmost importance. They combine with acid and basic substances, the former producing hydrates, the latter oxides.

Aqua. Water, H_2O.—(Syn., Hydrogen Monoxide; Fr. Eau; Ger. Aqua communis, Wasser.)

Natural water in its purest attainable state. By this the U. S. P. means any water—be it that of rain (*aqua pluvialis*), snow (*aqua nivalis*), spring (*aqua fontana*), river (*aqua fluvialis*), or lake (*aqua lacalis*), which is suitable for drinking—that does not curdle soap, has no metals, and contains only limited amounts of ammonia, soluble salts, sulphates, chlorides, nitrates, nitrites, or organic matter. It is a colorless, limpid, odorless, tasteless liquid.

PREPARATION.—1. *Aqua Destillata.* Distilled Water, H_2O. (Syn., Fr. Eau distillée, Hydrolat simple; Ger. Destillirtes Wasser.)

Manufacture: By distilling water 1,000 vols. and reserving the intermediate 800 vols. The first 100 vols. are liable to contain volatile substances, the last 100 vols. some solid and organic matters, hence both are rejected. It is a colorless, odorless, tasteless, neutral, limpid liquid, and should contain none of the following or above-mentioned likely impurities nor any carbonic acid. *Tests:* 1. With hydrogen sulphide, or ammonium sulphide (metals). 2. Ammonium oxalate (calcium). 3. Silver nitrate (chlorides). 4. Barium chloride (sulphates). 5. Mercuric chloride (ammonia). 6. Calcium hydrate (carbonic acid). 7. $H_2SO_4 + KMnO_4$ + heat (organic matter).

The purer water the softer; hard water curdles soap from presence of calcium (sulphate, carbonate) or magnesium salts, consequently it is ill adapted for domestic use.

PROPERTIES.—Demulcent, diuretic, diaphoretic, solvent, diluent.

Vapor bath accelerates circulation, causes profuse sweating.

Hot bath stimulates, producing redness of face and skin.

Warm bath slows respiration, reduces body temperature, relaxes skin, causes sleep. Good in febrile exanthematous diseases.

Cold bath abstracts heat, sometimes stimulant, tonic, sedative. Popular in febrile conditions, especially typhoid.

Mineral Waters.—Apart from the two preceding official waters there are a number of natural waters used medicinally, which contain one or more chemicals, and named according to active ingredient or therapeutic value. Thus we have:

Alkaline Waters, containing $NaHCO_3$ (usually predominates), $NaCl$, Na_2SO_4, and often free CO_2—Vichy, Kissingen, Carlsbad, Ems, Saratoga.

Chalybeate Waters, containing $FeSO_4$, Fe_2CO_3—Weisbaden, Brighton, Spa, Bedford, Rockbridge Alum.

Hepatic or Sulphur Waters, containing H_2S—Aix-la-Chapelle, White Sulphur, Blue Lick, Sharon, Richfield.

Bitter Waters, containing $MgSO_4$, $MgCl$—Hunyadi, Friedrichshall.

Carbonated Waters, containing Ca, Mg, Fe—carbonates held in solution by CO_2—Seltzer, Apollinaris, Old Sweet, etc.

Lithia Waters, containing lithium salts—Buffalo, Londonderry, Magnetic.

The list of such springs is lengthy, and all claim to be specific for one or more ailments. To obtain the benefit claimed it is always best to seek the spring itself, and there, free from cares, worries, etc., drink the waters under the directions of a resident physician.

Aqua Hydrogenii Dioxidi. Solution of Hydrogen Dioxide (Peroxide), H_2O_2.—(Syn., Oxygenized Water, Oxygen Hydrate; Fr. Soluté de Peroxide d'Hydrogen; Ger. Wasserstoff Hyperoxidlösung.)

Manufacture: Barium dioxide 300 Gm. is dissolved (or hydrated to a magma, by shaking vigorously) in cold distilled water 500 Cc., being chilled to 10° C. (50° F.). Now dissolve phosphoric acid 96 Cc. in distilled water 320, and to this add the hydrated magma in four portions, shaking and keeping cool, when neutral, filter, wash with distilled water until filtrate is 1,000 Cc., add 30 drops diluted sulphuric acid to filtrate + starch 10, agitate, filter—$BaO_2 + 2H_3PO_4 = Ba(H_2PO_4)_2 + H_2O_2$. This liquid is a slightly acid solution of H_2O_2, containing when fresh 3 p. c. by weight of pure dioxide, which corresponds to 10 vols. of available oxygen; it is colorless, odorless, with acid taste, causing a soapy, frothy sensation in the mouth, easily deteriorates by age or exposure, and when heated decomposes into $H_2O + O$; sp. gr. 1.010. Should be kept cool, dark, not too tightly stoppered, and should contain neither hydrofluoric acid nor barium. Dose, ʒj–3 (4–12 Cc.).

Properties.—Oxidizant, stimulant (nervous system), increases urine, antiseptic, decomposes pus, kills microbes, prevents fermentation.

Uses.—Diabetes, atonic dyspepsia, dyspnœa, epilepsy, low fevers, whooping-cough, asthma, phthisis, anæmia, chlorosis, pneumonia;

locally in mucous membrane inflammation, wounds, ulcers, ozæna, ophthalmia, gonorrhœa, leucorrhœa, chancres, otorrhœa, rhinitis, diphtheria, bronchitis, fetid breath, cystitis, spray, gargle. *Pyrozone* is claimed to be 50 p. c. When hydrogen dioxide is dissolved in glycerin instead of water we have what is called *glycozone.*

NITROGEN.

$N^{III} = 14.$

The element nitrogen (Gr. *νίτρον*, L. *nitrum*, niter, + *γενής*, *γένος*, produced from or generator of) is of considerable importance in medicine, owing to its ready combination with either hydrogen or oxygen, thus forming several very useful official compounds.

Aqua Ammoniæ. Ammonia Water, NH_4OH.—(Syn., Spirit of Hartshorn; Br. Liquor Ammoniæ, Spiritus Salis Ammoniaci Causticus, Ammonia Aqua Soluta; Fr. Ammoniaque liquide, Eau (Solution, Liqueur) d'Ammoniaque; Ger. Salmiakgeist, Aetzammoniak, Ammoniak-Flüssigkeit.) An aqueous solution of ammonia, NH_3, containing 10 p. c. by weight of the gas.

Manufacture: Heat ammonium chloride and calcium hydroxide mixed together, and pass the gas thus generated into water—$2NH_4Cl + Ca(OH)_2 = CaCl_2 + 2H_2O + 2NH_3$. It is a colorless, transparent, pungent, irritating, alkaline liquid, sp. gr. 0.960, no residue with heat, fumes when near HCl, should be tested for oxidizable matters, carbonic acid, calcium, metals, coal-tar bases, fixed impurities. *Assay:* To neutralize 3.4 Gm. should require 20 Cc. normal H_2SO_4 (each Cc. corresponding to 0.5 p. c. ammonia), rosolic acid indicator. *Impurities:* Ammonium chloride, sulphide, sulphate, etc. Should be kept cool, in glass-stoppered bottles. Dose, ♏x–20 (.6–1.3 Cc.), well diluted.

PREPARATIONS.—1. *Linimentum Ammoniæ.* Ammonia Liniment. (Syn., Volatile Liniment; Fr. Liniment (Savon) ammoniacal (volatil); Ger. Flüchtiges Liniment, Flüchtige Salbe.)

Manufacture: 35 p. c. Mix by agitation 35 Cc. with alcohol 5, cotton-seed oil 60; use externally.

2. *Spiritus Ammoniæ Aromaticus.* Aromatic Spirit of Ammonia. (Syn., Spiritus Ammoniæ Compositus, Spirit of Sal Volatile; Fr. Alcoolat ammoniacal aromatique; Ger. Aromatischer Ammoniakgeist.)

Manufacture: To ammonia water 9 Cc. add distilled water 14, then ammonium carbonate 3.4 Gm.; to alcohol 70 Cc. add oil of lemon 1, oil of lavender flowers 0.1, oil of nutmeg 0.1, mix two solutions, add distilled water q. s. 100 Cc., filter. It is nearly colorless, darkens with age, pungent ammoniacal odor and taste, sp. gr. 0.905. Dose, ♏x–60 (.6–4 Cc.), well diluted.

Preps.: 1. *Tinctura Guaiaci Ammoniata.* Guaiac 20 Gm., aromatic spirit of ammonia q. s. 100 Cc. Dose, ♏v–30 (.3–2 Cc.).

2. *Tinctura Valerianæ Ammoniata.* Valerian 20 Gm., aromatic spirit of ammonia q. s. 100 Cc. Dose, ʒss–2 (2–8 Cc.).

PROPERTIES.—Stimulant, antacid, irritant, rubefacient, caustic, corrosive poison; before meals increases, but after neutralizes gastric juice.

USES.—Heartburn, sick headache, stimulates circulation and respiration, paralyzes the heart muscle. It is said to be oxidized in the system, forming nitric acid, which is eliminated by kidneys; externally in rheumatism, neuralgia, congestion of larynx, throat, bowels, amenorrhœa, burns, frost-bite, vulvular pruritus, syncope, bronchitis, hoarseness, acidity, whooping-cough, stings (of bees, mosquitoes, spiders, wasps, etc.); antidote to chlorine, bromine, hydrocyanic acid, alcoholic intoxication. Should be applied mixed with oil by gentle friction.

Poisoning: Give vegetable acids (vinegar, lemon juice), oil, demulcents, opium for the pain.

Synergists: Cardiac and diffusible stimulants, antispasmodics, capsicum, cantharides, counter-irritants.

Aqua Ammoniæ Fortior. Stronger Ammonia Water, NH_4OH. —(Syn., Br. Liquor Ammoniæ Fortis; Fr. Eau d'Ammoniaque forte; Ger. Stärker Salmiakgeist.) An aqueous solution of ammonia (NH_3), containing 28 p. c. by weight of the gas.

Manufacture: Same as aqua ammoniæ, only much more gas is required to give the 28 p. c. saturation. It is a colorless, transparent liquid, having an excessively pungent odor, very acrid and alkaline taste, alkaline reaction, sp. gr. 0.901. *Assay:* To neutralize 1.7 Gm. should require 28 Cc. normal H_2SO_4 (each Cc. corresponding to 1 p. c. ammonia), rosolic acid indicator. *Impurities:* The same as aqua ammoniæ—Ammonium chloride, sulphide, sulphate, etc. Should be kept cool, in strong glass-stoppered bottles, partly filled. Dose, ♏iij–6 (.2–.4 Cc.), well diluted.

PREPARATION.—1. *Spiritus Ammoniæ.* Spirit of Ammonia. (Syn., Spiritus Ammoniaci Caustici Dezondii, Ammoniated Alcohol; Fr. Alcoolé d'Ammoniaque, Liqueur d'Ammoniaque vineuse; Ger. Liquor Ammonii Caustici Spirituosus, Weingeistige Ammoniak (flüssigkeit).) An alcoholic solution of ammonia (NH_3), containing 10 p. c. by weight of the gas.

Manufacture: Heat carefully stronger ammonia water 25 Cc. to 60° C. (140° F.) for ten minutes, condensing the gas therefrom in alcohol 50 Cc. It is a colorless liquid, strong odor, sp. gr. 0.810. *Tests:* Same as for aqua ammoniæ. Dose, ♏x–30 (.6–2 Cc.), well diluted.

PROPERTIES.—Too strong for internal use unless largely diluted.

Externally, rubefacient; should be mixed with spirit of camphor, oil of rosemary, etc., for rheumatism, neuralgia, spasmodic and inflammatory affections.

Spirit: This is stimulant, antispasmodic; given in hysteria, flatulent colic, nervous debility, sick headache.

Acidum Nitricum. Nitric Acid, HNO_3.—(Syn., Acidum Nitri, Acidum Azoticum, Spiritus Nitri Acidus, Spirit of Nitre, Aqua Fortis; Fr. Acide nitrique, Acide azotique; Ger. Salpetersäure.) A liquid composed of 68 p. c. by weight, of absolute nitric acid (HNO_3) and 32 p. c. of water.

Manufacture: It is obtained by combining nitrogen pentoxide with water—$N_2O_5 + H_2O = 2HNO_3$, or by double decomposition between potassium nitrate or sodium nitrate and sulphuric acid, with heat—$NaNO_3 + H_2SO_4 = HNO_3 + NaHSO_4$, or $2NaNO_3 + H_2SO_4 = 2HNO_3 + Na_2SO_4$. It is a colorless, volatile, fuming, caustic, corrosive, suffocating liquid, sp. gr. 1.1414. *Tests:* 1. It dissolves Cu, Ag, Hg, with evolution of red nitrous fumes, stains animal tissues and woollen fabrics yellow; discharges the blue color from indigo T. S. 2. To a nitrate solution add H_2SO_4, then add carefully to this a solution of $FeSO_4$, when a dark-colored layer occurs between the two former liquids. *Assay:* To neutralize 3.145 Gm. should require 34 Cc. potassa V. S. (each Cc. corresponding to 2 p. c. of absolute acid), phenolphtalein indicator. *Impurities:* Pb, Fe, Cu, H_2SO_4, HCl, I, Br, iodic or bromic acid. Dose, ♏ij–5 (.13–.3 Cc.), well diluted.

PREPARATIONS.—1. *Acidum Nitricum Dilutum.* Diluted Nitric Acid. (Syn., Fr. Acide Azotique dilué; Ger. Verdünnte Salpetersäure.)

Manufacture: 10 p. c. by weight. Mix nitric acid 100 Gm., distilled water 580 Gm.; sp. gr. 1.057. *Assay:* To neutralize 6.29 Gm. should require 10 Cc. potassa V. S. (each Cc. corresponding to 1 p. c. of absolute acid), phenolphtalein indicator. It should be kept in well-stoppered amber bottles. Dose, ♏v–30 (.3-2 Cc.), well diluted.

2. *Acidum Nitrohydrochloricum.* Nitrohydrochloric Acid. (Syn., Nitromuriatic Acid. Aqua Regia (Regis); Fr. Acide Chloro(azotique)-nitreux, Eau régale; Ger. Acidum Chloro-nitrosum, Salpetersalzsäure, Königswasser.)

Manufacture: Mix gradually nitric acid 18 Cc., hydrochloric acid 82 Cc. The two acids act chemically upon each other, forming chloronitrous or chloronitric gas and chlorine, upon which the great dissolving power depends—(1) $HNO_3 + 3HCl = NOCl + 2H_2O + 2Cl$. (2) $2HNO_3 + 6HCl = 2NOCl_2 + 4H_2O + 2Cl$. It is a yellow, fuming, corrosive liquid with chlorine odor, volatile, dissolves gold leaf and liberates iodine from potassium iodide T. S. This should be kept in half-filled, well-stoppered amber bottles. Dose, ♏ij–5 (.13–.3 Cc.), well diluted.

Prep.: 1. *Acidum Nitrohydrochloricum Dilutum.* Diluted Nitrohydrochloric Acid. (Syn., Diluted Nitromuriatic Acid; Fr. Acide Chlorazotique dilué; Ger. Verdünnte Salpetersalzsäure.)

Manufacture: Mix nitric acid 4 Cc., hydrochloric acid 18 Cc., distilled water 78 Cc.

This is very similar to the preceding, but properties weaker, chlorine odor faint. Should be kept with same precautions. Dose, ♏v–30 (.3–2 Cc.), well diluted.

PROPERTIES.—Tonic, antiseptic, astringent, cholagogue; tans yellow.

USES.—Intestinal indigestion with diarrhœa, syphilis, chronic hepatitis, intermittents, jaundice, scrofula, dysentery, whooping-cough, bronchitis, to allay thirst in fever, diabetes, diminishes phosphatic deposits in urine, gravel. Externally to destroy chancres, warts, hemorrhoids, phagedenic ulcers, bites of snakes and rabid dogs, test for albumin in urine. As a lotion for ulcers, chilblains, and antiseptic purposes. Checks acidity if given before meals.

Poisoning: From an excessive dose of strong acids, have burning acute pain from the entire covered tract, nausea, hiccough, vomiting, swollen, tender, cold abdomen, great thirst, nearly always fatal. Give the antidotes—alkaline solutions, soap, magnesia, chalk, mucilaginous drinks, almond or olive oil, emollient fomentations.

Incompatibles: Alcohol, alkalies, carbonates, oxides, iron sulphate, lead acetate.

CARBON.

$C^{iv} = 12.$

The element carbon (L. *carbo*, coal, Skt. *cra*, to cook) in the free state is of the greatest use in its several forms (official and non-official), while in combination it is of infinite importance, as it enters into the composition of so many medicinal compounds.

Carbo Ligni. Charcoal.—(Syn., Wood Charcoal, Vegetable Charcoal, Carbo Præparatus, Carbo e Ligno; Fr. Charbon végétal, Charbon de Bois; Ger. Holzkohle, Präparirte Kohle.)

Manufacture: Charcoal is prepared from soft wood (willow, poplar, etc.) by exposure to red heat (300° C.; 572° F.) without access of air, then very finely powdered. In burning wood thus in a retort or under turf, the hydrogen and oxygen are driven off, leaving behind only carbon, if much air be admitted, will also have considerable ash. Charcoal yields when burnt ash 1–2 p. c. It is black, odorless, tasteless, non-gritty, very light, not affected by reagents. *Test:* If 1 Gm. be boiled with 3 Cc. potassa T. S. + 5 Cc. water, should have a colorless filtrate (showing complete carbonization). Should be kept in well-closed vessels. Dose, gr. 15–60 (1–4 Gm.).

PREPARATIONS.—(Unoff.) *Lozenges, Biscuit, Capsules.* Mostly taken in water.

PROPERTIES.—Disinfectant, absorbent, deodorizer, decolorizer. Absorbs gases, condensing them within its pores, especially oxygen. When thus condensed it has an oxidizing action like ozone, parting regularly with its oxygen in the presence of oxidizable substances. It easily oxidizes H_2S, thus decomposing organic matter when in the dry form.

USES.—Diarrhœa, dyspepsia with fetid breath, gastralgia, pyrosis, diabetes, constipation, nausea, intermittent fevers, worms; large doses purgative. Externally in dressing wounds, ulcers, gangrenous sores, fetid stools in typhoid fever, etc.

Carbo Animalis. Animal Charcoal.—(Syn., Bone Black, Ivory

Black, Carbo Ossium, Ebur Ustum, Spodium; Fr. Charbon animal, Noir d'Os; Ger. Thierkohle, Knochenkohle, Beinschwarz.)

Manufacture: This is prepared from bone by exposing it to a red heat, without access of air, and consists of carbon 10 p. c. + calcium carbonate and phosphate 85–90 p. c. The bones are first boiled in water to remove fat, then put in iron cylinders and subjected to great heat, the volatile products are gases, then there is an ammoniacal aqueous liquid—bone spirit, and a blackish tar called bone oil. Charcoal is a dull-black granular or fine powder, odorless, nearly tasteless, insoluble in water or alcohol, and ignited yields ash 85 p. c., which should be soluble in HCl with aid of heat. *Test:* Boil 1 Gm. with 3 Cc. potassa T. S. + 5 Cc. water, should give a colorless filtrate (showing complete carbonization).

PREPARATION.—1. *Carbo Animalis Purificatus.* Purified Animal Charcoal. (Syn., Fr. Charbon animal purifié; Ger. Gereinigte Knochenkohle.)

Manufacture: Boil gently for ten hours animal charcoal 100 Gm., hydrochloric acid 300 Gm., water 200 Cc., wash residue with boiling water 1,200–1,500 Cc., dry; the acid dissolves out the earthy salts (calcium carbonate and phosphate). It is a dull-black, odorless, tasteless powder, insoluble. *Tests:* Ignite 2 Gm. getting a residue 0.08 Gm. or 4 p. c. of the original weight (limit of silicates and other fixed inorganic matter), and when boiled with potassa T. S. should be colorless (showing complete carbonization). Dose, gr. 15–60 (1–4 Gm.), mostly as an antidote.

USES.—From its absorbing coloring matter it is used in the preparation of organic alkaloids to decolorize them in aqueous solutions. The colored decoction or infusion is boiled or percolated with the charcoal, which not only takes out the coloring matter, but frequently a portion of the alkaloids—in fact quite all of some active constituents can be extracted by this process. After boiling with charcoal this latter is washed, dried, and then digested in boiling alcohol, which is reclaimed, leaving as a residue the alkaloid, bitter principle, etc. By this process have been extracted arnicin, colocynthin, columbin, digitalin, ilicin, scillitin, quinine, strychnine, etc., while lime, iodine, basic lead, and other metallic salts can likewise be removed.

When poisoned by opium, aconite, strychnine, as an antidote must give of the purified charcoal at least half ounce (15 Gm.) for each grain (.06 Gm.) of the alkaloid; it should be left in the stomach some minutes, then removed by a pump or emetic. Must not remain, however, too long as poison will be redissolved, again going into circulation.

Carbonei Disulphidum. Carbon Disulphide, CS_2.—(Syn., Carbonis Bisulphidum, Carbon Sulphide; Fr. Sulfure de Carbone; Ger. Carboneum Sulfuratum, Alcohol Sulfuris, Schwefelkohlenstoff, Schwefelalkohol.)

Manufacture: It is made by dropping sulphur upon red-hot charcoal in a furnace; the sulphur, liquefying and vaporizing, combines with the carbon, and the CS_2 formed distils over through condensing tubes, where it remains, while the H_2S formed at the same time passes beyond and escapes. It has to be rectified to eliminate free sulphur and all other bad-smelling sulphur compounds. It is a clear, colorless, refractive, diffusive liquid, strong, characteristic, but not fetid odor, sharp, aromatic taste, soluble in alcohol, ether, chloroform, fixed and volatile oils, sp. gr. 1.269. *Test:* Should not change blue litmus (abs. SO_2), nor leave a residue (abs. dissolved sulphur), nor blacken with lead acetate T. S. (abs. H_2S). Should be kept cool in well-stoppered bottles or tin cans, remote from lights or fires.

PROPERTIES.—Anæsthetic, rubefacient, refrigerant, irritant, poisonous; mostly used externally. Workmen subjected to its fumes have headache, vertigo, nervousness, voluble talking, incoherent singing, laughing, weeping, weakness, loss of sexuality, impaired vision, hearing, memory, death.

USES.—Locally, blunts sensibility, hence used in opening abscesses, evulsion of nails, also to relieve headache, toothache, neuralgia, enlarged lymphatic glands, goitre, lupoid, syphilitic growths, deafness, with insufficient wax; to dissolve rubber, oils, etc. Internally ♏ss (.03 Cc.) for pains of gastric cancer, nausea, vomiting, gastralgia, enteric fever.

SILICIUM. SILICON.

$Si^{iv} = 28.3.$

The element silicon (L. *silex, silicis*, flint, which is nearly all silica = silicon oxide), like boron, resembles carbon. It is infusible, insoluble, non-volatile, and is met with in crystals as well as amorphous. It occurs mostly as silicon dioxide (silica) SiO_2—agate, amethyst, chalcedony, flint, quartz, rock crystal, sand, but also as silicates, which is silicic acid having its hydrogen replaced by metals—basalt, feldspar, granite, mica, porphyry, etc. The sodium silicate is the only one of medical importance, and of this we have one official preparation.

Liquor Sodii Silicatis. Solution of Sodium Silicate.—(Syn., Liquid (Soluble) Glass, Natrum Silicium Solutum, Vitrium Solubile; Fr. Silicate de Soude liquide, Verre soluble, Verre liquide; Ger. Natriumsilikat-Lösung, (Flüssiges) Wasserglas, Natronwasserglas.)

Manufacture: It is made by fusing 1 part fine sand or flint with 2 parts of dried Na_2CO_3, lixiviate the product with boiling water, filter, evaporate. It is a semitransparent, yellowish or greenish viscid liquid, odorless, taste sharply saline, alkaline, sp. gr. 1.350; contains 33 p. c. of sodium trisilicate and tetrasilicate mixed; with nitric acid gives precipitate of silicic hydrate. Should be kept in well-stoppered bottles.

PROPERTIES.—Deodorant, antiseptic, antiferment, astringent, stimulant.

USES.—Mainly in surgery for making immovable bandages for fractures, coating in erysipelas, like collodion, injection in gonorrhœa, etc.

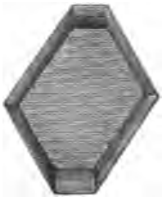
BORON.

$B^{iii} = 11$.

The element boron (L. *bor*(*ax*) + *on*, fr. Ar. *baraqa*, shine, glisten, substance from which the element was first obtained) resembles carbon very closely. It is infusible, non-volatile, insoluble, and is sparingly found in nature. Occurs as either boric (boracic) acid or sodium biborate (borax). Chiefly in Italy and California.

Acidum Boricum. Boric (Boracic) Acid, H_3BO_3.—(Syn., Acidum Boracicum; Fr. Acide borique (crystallisé); Ger. Borsäure.)

FIG. 414.



Boric acid crystal.

Manufacture: Occurs in nature free and combined, but for medicine is usually prepared by adding H_2SO_4 or preferably HCl to a solution of sodium borate (borax). The boric acid is precipitated while sodium sulphate or chloride is left in solution—$Na_2B_4O_7 + 10H_2O + H_2SO_4 = 4H_3BO_3 + Na_2SO_4 + 5H_2O$, or $Na_2B_4O_7 + 10H_2O + 2HCl = 4H_3BO_3 + 2NaCl + 5H_2O$.

The H_2SO_4 adheres to the boric acid while HCl does not, hence to get rid of the former several recrystallizations have to be made. It is in transparent, colorless, pearly scales or crystals, odorless, bitterish, soluble in 25.6 parts of water, 15 alcohol, 10 glycerin. *Tests:* The alcoholic solution should not give yellow but a greenish flame; turns yellow turmeric paper brown. *Impurities:* Sulphate (barium chloride), chloride (silver nitrate), Pb, Cu, Fe (ammonium sulphide), calcium (ammonium oxalate), magnesium (sodium phosphate), sodium (flame), ammonia (should be odorless when heated with potassa). Dose, gr. 5–30 (.3–2 Gm.).

PREPARATIONS.—1. *Glyceritum Boroglycerini.* Glycerite of Boroglycerin. (Syn., Glycerite of Glyceryl Borate, Solution of Boroglyceride; Fr. Liqueur (Soluté) de Boroglyceride; Ger. Boroglyceridlösung.)

Manufacture: Heat boric acid 31 Gm. with glycerin 46 Gm. until reduced to 50 Gm., constantly stirring, add glycerin 50 Gm.—antiseptic.

Unoff. Preps.: Solution, 1–5 p. c. *Ointment,* 20–25 p. c.

PROPERTIES.—Antiseptic, poisonous.

USES.—Dyspepsia, restores ammoniacal urine; externally conjunctivitis, aphthous ulcers of mouth, diphtheria, vaginitis, otorrhœa, pharyngitis, burns, ulcers, boils, pruritus, urticaria, eczema, psoriasis, catarrh, cystitis, gonorrhœa, erysipelas, tinea, fetid feet. Triturated with ether facilitates its powdering.

SULPHUR.

$S^{ii} = 32$.

The element sulphur (AS. *swefel*, fr. Skt. *culva*, copper, + *ari*, enemy to, or L. *sal*, salt, + Gr. *πῦρ*, fire, its combustible quality—brimstone, has same meaning, brynstone, burnstone) is found free in volcanic districts, as of Sicily, and universally in combination as sulphates, sulphides, etc. We have several official forms.

Sulphur Sublimatum. Sublimed Sulphur.—(Syn., Flores Sulphuris, Flowers of Sulphur, Brimstone; Fr. Soufre (sublimé), Fleurs (Crême) de Soufre; Ger. Schwefel (blumen), Schwefelblüthe.)

Manufacture: It is prepared by subliming the crude sulphur and passing the vapors into large condensing chambers, thus leaving behind all of the earthy impurities save arsenic, which, when present, goes over as arsenic sulphide, also by oxidization during sublimation may have formed sulphurous and sulphuric acids, all of which must be removed.

Sulphur is a fine yellow powder, slight characteristic odor, acrid taste; soluble by boiling in alkaline hydrates, also partially in ether, chloroform, benzene, carbon disulphide, oil of turpentine; it vaporizes, giving off SO_2, which is recognized by odor and its darkening paper moistened with mercurous nitrate T. S. Dose, gr. 10–60 (.6–4 Gm.).

PREPARATIONS.—1. *Sulphur Lotum.* Washed Sulphur. (Syn., Fr. Soufre lavé; Ger. Sulfur Depuratum, Flores Sulfuris Loti, Gereinigter Schwefel(blumen).)

Manufacture: Digest for three days sublimed sulphur 100 Gm., ammonia water 10 Cc., water 200 Cc., strain, wash sulphur well, then dry. This removes acid (sulphuric) impurities and arsenic—$H_2SO_4 + As_2S_3 + 8NH_4OH = (NH_4)_2SO_4 + (NH_4)_3AsO_3 + (NH_4)_3AsS_3 + 5H_2O$. It is a fine yellow powder, odorless, tasteless, insoluble in water. *Impurities:* Acids, ammonia, arsenic, selenium, other metals.

Preps.: 1. *Unguentum Sulphuris.* Sulphur Ointment. (Syn., Fr. Pommade soufrée, Pomatum Sulfuratum; Ger. Unguentum Sulfuratum Simplex, Schwefelsalbe.)

Manufacture: Rub washed sulphur 30 Gm. with benzoinated lard 70 Gm. gradually added, mix thoroughly. Use externally.

2. *Pulvis Glycyrrhizæ Compositus*, 8 p. c. Dose, ʒss–2 (2–8 Gm.).

2. *Sulphur Præcipitatum.* Precipitated Sulphur. (Syn., Lac Sulphuris, Milk of Sulphur, Magisterium Sulphuris; Fr. Soufre précipité, Magistère (Lait) de Soufre; Ger. Schwefelmilch.)

Manufacture: Boil one hour sublimed sulphur 100 Gm., lime 50, water 1,500 Cc., decant, filter, precipitate filtrate with diluted hydrochloric acid, wash well, dry.

$$(1)\quad \underset{\text{hydroxide,}}{3Ca(OH)_2} + S_{12} = \underset{\text{polysulphide,}}{2CaS_5} + \underset{\text{hyposulphite.}}{CaS_2O_3} + 3H_2O.$$

$$(2)\quad 2CaS_5 + CaS_2O_3 + 6HCl = 3CaCl_2 + 3H_2O + S_{12}, \text{ or}$$

$$(3)\quad CaS_5 + 2CaS_2O_3 + 6HCl = S_6 + 2H_2O + H_2S + 2SO_2 + 3CaCl_2.$$

This is more finely divided than sublimed sulphur, consequently is nearly a white or pale-yellow powder, odorless, tasteless, volatile, soluble in ether, benzine, chloroform, carbon disulphide, and soda T. S. without residue (abs. earthy or metallic impurities), when treated with ammonia water and hydrochloric acid added to clear filtrate should not get turbidity (abs. arsenic). It should contain neither acid, alkali, selenium (red with KCN + HCl), arsenic, nor calcium sulphate, which makes it gritty. Dose, gr. 10–60 (.6–4 Gm.).

Prep.: (Unoff.) *Ointment.*

PROPERTIES.—Alterative, laxative, diaphoretic, resolvent, antiparasitic, stimulant. Much of it passes out of the system unchanged, a little is converted into sulphides and hydrogen sulphide, this latter being excreted by the breath and skin; gives patients a disagreeable odor, and blackens all silver wearing effects; it increases peristalsis, making movements softer and more frequent. Sulphides after entering the blood are excreted in the urine as sulphates.

USES.—Constipation, hemorrhoids, pregnancy, rectal fissure, stricture or prolapsus, lead poison, chronic rheumatism, gout, bronchitis, asthma. Externally, scabies, diphtheria, sciatica, psoriasis, eczema, acne, sycosis, croup. The *washed* and *precipitated* are better internally, as they contain no arsenic; the latter is best for ointment, owing to its finer division.

Acidum Sulphuricum. Sulphuric Acid, H_2SO_4.—(Syn., Oil of Vitriol, Vitriolic Acid; Fr. Acide sulfurique, Huile de Vitriol; Ger. Vitriolöl, Schwefelsäure.) A liquid composed of not less than 92.5 p. c. by weight of absolute sulphuric acid (H_2SO_4), and not more than 7.5 p. c. of water.

Manufacture: It is made by burning sulphur or pyrites, and oxidizing the SO_2 thus obtained by HNO_3, then passing this sulphuric oxide into steam, whereby sulphuric acid condenses in leaden chambers arranged for the purpose; from these it is drawn off and evaporated to the proper strength. In actual practice the SO_2 is passed over fumes of NO_2 arising from the decomposition of KNO_3 or $NaNO_3 + H_2SO_4$ in the presence of a full supply of air. The sulphurous oxide, SO_2, will not take up O to become sulphuric oxide, SO_3, from the air alone, hence this indirect method has to be used; the nitric acid is deoxidized into nitric oxide, and this unites with O of air to form nitric peroxide, while this again supplies fresh O to the sulphurous acid:

(1) $S_2 + O_4 = 2SO_2$. (2) $SO_2 + H_2O = H_2SO_3$. (3) $2NO + O_2 = 2NO_2$. (4) $H_2SO_3 + NO_2 = H_2SO_4 + NO$. (5) $3H_2SO_3 + 2HNO_3 = 3H_2SO_4 + H_2O + 2NO$. (6) $SO_2 + O + H_2O = H_2SO_4$.

In this process five things are evidently necessary; sulphur, nitre (HNO_3), air, watery vapor, heat. It is a colorless, oily, inodorous, corrosive liquid, sp. gr. 1.835, volatile. *Test:* With barium chloride T. S. get white precipitate insoluble in HCl. *Assay:* To neutralize 0.489 Gm. diluted, should require 9.25 Cc. potassa V. S. (each 0.1 Cc. corresponding to 1 p. c. absolute acid), phenolphtalein indicator. *Impurities:* Lead (from chambers), nitric and nitrous acids (from nitrous fumes), arsenic (from impure sulphur), water (from poor evaporation), also iron, copper, thallium and sulphurous acid. Dose, ♏ij–5 (.13–.3 Cc.), well diluted.

PREPARATIONS.—1. *Acidum Sulphuricum Dilutum.* Diluted Sulphuric Acid. (Syn., Fr. Acide sulfurique dilué; Ger. Verdünnte Schwefelsäure.)

Manufacture: Add gradually, constantly stirring, sulphuric acid 100 Gm. to distilled water 825 Gm. Contains 10 p. c. by weight of absolute sulphuric acid; sp. gr. 1.070. *Assay:* To neutralize 4.89 Gm. should require 10 Cc. potassa V. S. (each Cc. corresponding to 1 p. c. of absolute acid). Dose, ♏v–30 (.3–2 Cc.), well diluted.

2. *Acidum Sulphuricum Aromaticum.* Aromatic Sulphuric Acid. (Syn., Elixir of Vitriol, Tinctura Aromatica Acida; Fr. Elixir vitriolique, Teinture (alcoolé) aromatique sulfurique; Ger. Elixir Vitrioli Mynsichti, Saure Aromatische Tinktur, Mynsicht's Elixir.)

Manufacture: Add gradually sulphuric acid 10 Cc. to alcohol 70 Cc., cool, add tincture of ginger 5 Cc., oil of cinnamon 0.1, alcohol q. s. 100 Cc. Contains about 20 p. c. by weight of official acid, partly in form of ethyl sulphuric acid; sp. gr. 0.939. *Assay:* To neutralize 4.89 Gm. boiled in water 15 Cc. to decompose the ethyl sulphuric acid, should require 18.5 Cc. potassa V. S. (each Cc. corresponding to 1 p. c. absolute acid, or 1.08 p. c. of official sulphuric acid). Should be kept in glass-stoppered bottles. Dose, ♏v–20 (.3–1.3 Gm.), well diluted.

Prep.: 1. *Infusum Cinchonæ,* 1 p. c. (+ cinchona 6 p. c.). Dose, ℥ss–2 (15–60 Cc.).

PROPERTIES.—Powerful escharotic, charring black and destroying the parts touched, by abstracting water in the tissues and combining with the albumin; it promotes alkaline secretions, tonic, astringent, poisonous.

USES.—Diarrhœa, hemorrhages, night-sweats, mucous discharges, cholera, quench thirst in fevers, cholera morbus, lead colic, gravel, stone, tapeworms, gastric disorders. Externally, ulcers, gangrene, cancers, caries of bones, ringworms, scabies (ointment 1 part to 8).

Poisoning: Give chalk, magnesia, magnesium carbonate, alkaline carbonates, demulcent drinks, oils, egg-white, avoid pump.

Acidum Sulphurosum. Sulphurous Acid, H_2SO_3.—(Syn., Sulphurous Anhydride, Sulphur Dioxide; Fr. Acide sulfureux; Ger. Schweflige-Säure.) A liquid composed of 6.4 p. c. by weight of sulphurous acid gas (SO_2), and 93.6 p. c. water.

Manufacture: Heat sulphuric acid 8 Cc., charcoal 2 Gm. passing the gas through a wash-bottle containing water, into distilled water 100 Cc.; a second wash-bottle containing Na_2CO_3 solution (to absorb any excess of gas not retained by distilled water) is also here attached. The sulphuric acid thus becomes deoxidized—$2H_2SO_4 + C = CO_2 + 2H_2SO_3$. It is a colorless, acrid liquid, burning sulphur (SO_2) odor, sulphurous taste, sp. gr. 1.035, volatile. *Tests:* When heated the evolved gas blackens paper moistened with mercurous nitrate T. S., but no effect on lead acetate T. S.; no precipitate with barium chloride T. S., unless chlorine (HCl) added, and this when heated with Zn evolves H_2S, which blackens paper moistened with lead acetate T. S. *Assay:* 2 Gm. + 25 Cc. water + little starch T. S., should require

40 Cc. $\frac{N}{10}$ iodine V. S. before permanent blue is developed (each Cc. corresponding to 0.16 p. c. SO_2). *Impurities:* Sulphuric acid, metals, too little sulphur dioxide. Dose, ʒss–2 (2–8 Cc.), diluted with water; can be applied externally diluted with water, glycerin or fat.

This acid is very easily decomposed by absorbing oxygen, thus becoming oxidized into sulphuric acid of about the same strength.

Properties.—Antiseptic, germicide, parasiticide, deoxidizing agent, disinfectant, destructive to plant life, deodorizer (from its great affinity for oxygen, abstracting it from organic bodies), irritant (from SO_2).

Uses.—Throat affections locally as a spray, mop, diphtheria, chronic bronchitis, stomatitis, aphthæ, tonsil ulcers, syphilitic and tuberculous laryngitis, wounds, scabies, thrush, whooping-cough. Internally, urticaria, fermentative dyspepsia, flatulence, vomiting, especially when vomit frothy and yeasty.

PHOSPHORUS. PHOSPHORUS.

$P^{iii} = 31.$

(Syn., Fr. Phosphore; Ger. Phosphor.)

The element phosphorus (Gr. φῶς, light, + φέρειν, to bring; *i. e.*, emits light in the dark) is official and occurs in nature combined with various metals (Ca, Fe, Al, etc.), as phosphates, also in plants and animals, constituting about 60 p. c. of all bones in the form of tricalcium phosphate.

Manufacture: This is obtained by treating ground bones with H_2SO_4, when calcium sulphate is precipitated and calcium acid phosphate remains in solution. The latter is evaporated and distilled with sand and charcoal; this removes the oxygen and allows the vapor phosphorus to distil over, which is condensed under water.

$$(1)\ \underset{\text{Tricalcium phosphate.}}{Ca_32PO_4} + 2H_2SO_4 = \underset{\text{Calcium acid phosphate.}}{CaH_42PO_4} + 2CaSO_4.\quad (2)\ CaH_42PO_4 + \text{heat} = \underset{\text{Calcium metaphosphate.}}{Ca2PO_3} + 2H_2O.\quad (3)\ 2(Ca2PO_3) + 2SiO_2 + 10C = 2CaSiO_3 + 10CO + 4P.$$

It is a translucent, nearly colorless waxy solid, resembling beeswax, by keeping turns red or black, distinctive, disagreeable odor and taste; emits, on exposure, white fumes garlicky odor, luminous in the dark, by long exposure takes fire spontaneously, sp. gr. 1.830, soluble in chloroform, CS_2, also in 50 parts of fat oils. *Tests:* 1. Heat with dil. HNO_3 until dissolved, through this pass H_2S, should only get small quantity of lemon-yellow precipitate (limit of arsenic, liable to be present from the H_2SO_4 used). 2. Now add to remaining liquid barium chloride T. S., only a slight opalescence should be produced (limit of sulphur also present from the sulphuric acid used). It should be carefully kept dark under water, in strong, well-closed vessels in a secure, cool place. Dose, gr. $\frac{1}{100}$–$\frac{1}{30}$ (.0006–.002 Gm.).

PREPARATIONS.—1. *Oleum Phosphoratum.* Phosphorated Oil. (Syn., Fr. Huile phosphorée, Liniment phosphoré; Ger. Phosphorhaltiges Oel.)

Manufacture: 1 p. c. Heat in flask, on sand-bath, 15 minutes phosphorus 1 Gm., expressed oil of almond 90 Gm., when cool add ether q. s. 100 Gm. Dose, ♏j–5 (.06–.3 Cc.).

2. *Pilulæ Phosphori.* Pills of Phosphorus. (Syn., Fr. Pilules au Phosphore, Pilules phosphorées; Ger. Phosphorpillen.)

Manufacture: Dissolve phosphorus .06 Gm. in chloroform 5 Cc., add this to althæa 6 Gm., acacia 6 Gm., mix, add mixture of glycerin 2 vols.+water 1, q. s. (4 Cc.) for mass, which divide into 100 pills; dissolve balsam of tolu 10 Gm. in ether 15 Cc., in this shake pills until coated, roll on plate until dry. Each pill contains gr. $\frac{1}{100}$ (.0006 Gm.). Dose, 1–5 pills.

3. *Spiritus Phosphori.* Spirit of Phosphorus. (Syn., Tincture of Phosphorus; Fr. Alcoolat (Esprit) de Phosphore; Ger. Phosphorspiritus.)

Manufacture: $\frac{1}{8}$ p. c. Dissolve phosphorus .12 Gm. in absolute alcohol 100 Cc. by gently boiling. Each ʒj (4 Cc.) contains gr. $\frac{1}{12}$ (.005 Gm.), or ♏ 14.4 (1 Cc.), contain gr. $\frac{1}{50}$ (.0013 Gm.) of phosphorus. Dose, ♏viij–40 (.5–2.6 Cc.).

Prep.: 1. *Elixir Phosphori.* Elixir of Phosphorus.

Manufacture: To spirit of phosphorus 21 Cc. add oil of anise 0.2 Cc., glycerin 55 Cc., mix, add aromatic elixir in several portions, with agitation, q. s. 100 Cc. Each ʒj (4 Cc.) contains gr. $\frac{1}{65}$ (.001 Gm.) of phosphorus. Dose, ʒss–2 (2–8 Cc.).

PROPERTIES.—Stimulant, tonic, nervine, diaphoretic, irritant, poisonous, nauseant, thickens and renders bones more dense, diminishes tissue waste. A portion is oxidized into phosphoric acid, and as such enters the blood, some is dissolved by fats and oils of stomach thus being absorbed as phosphorus.

USES.—Sexual exhaustion, cerebral softening, mania, melancholia, nerve-debility from overwork, worry, typhoid conditions, scarlet fever, measles, chronic eczema, psoriasis, neuralgia, angina pectoris, aphrodisiac, locomotor ataxia.

Poisoning: Have great intestinal irritation, vomiting, purging, skin cold, pulse feeble, rapid, syncope, death from exhaustion. Empty stomach, give hydrated magnesia, lime water, charcoal, copper sulphate, potassium permanganate, opium and old (acid) oil of turpentine, this latter being its best antidote. No oils or fats should be used, as they dissolve the phosphorus, thus promoting its absorption. It is eliminated mostly by the urine, as ortho-phosphoric acid, increasing excretion of urinary phosphates, hence evacuate bladder frequently.

Synergists: Restoratives, cod-liver oil, arsenic, sulphur.

Acidum Phosphoricum. Phosphoric Acid, H_3PO_4.—(Syn., Fr. Acide phosphorique; Ger. Phosphorsäure.) A liquid composed of not less than 85 p. c. by weight of absolute orthophosphoric acid (H_3PO_4) and 15 p. c. of water.

Manufacture: It is made by oxidizing phosphorus with diluted nitric acid; the two are heated together in a retort until nitrous fumes cease to form, and then concentrating or diluting to desired strength— $5HNO_3 + P_3 + 2H_2O = 3H_3PO_4 + 5NO$.

It is a colorless, odorless liquid, acid taste, sp. gr. 1.710. When heated changes gradually into pyrophosphoric acid. At a higher temperature is converted into metaphosphoric acid, which volatilizes in dense fumes, or forms on cooling a transparent mass of glacial phosphoric acid. *Test:* Saturate a little with ammonia + magnesium sulphate T. S., get white precipitate, which, if dissolved in diluted acetic acid, and silver nitrate T. S. added gives yellow precipitate. *Assay:* 0.978 Gm. diluted with water should require 17 Cc. potassa V. S. for neutralization (each Cc. corresponding to 5 p. c. absolute acid), phenolphtalein indicator. *Impurities:* Nitric acid (with $FeSO_4$), phosphorous acid (should not blacken with silver nitrate T. S. nor become turbid with mercuric chloride T. S.), arsenic (with stannous chloride + tin foil), phosphate (with mixture of alcohol 3 Cc. + ether 1 Cc. should have no turbidity), iron (no precipitate with ammonium sulphide T. S.), sulphuric acid (no precipitate with barium chloride T. S.), hydrochloric acid (no precipitate with silver nitrate T. S.), pyrophosphoric and metaphosphoric acids (no precipitate with tincture of ferric chloride). Should be kept in glass-stoppered bottles. Dose, ♏ij–5 (.13–.3 Cc.), well diluted.

PREPARATION.—1. *Acidum Phosphoricum Dilutum.* Diluted Phosphoric Acid. (Syn., Fr. Acide phosphorique médicinal; Ger. Verdünnte Phosphorsäure.)

Manufacture: Mix phosphoric acid 10 Gm. with distilled water 75 Gm.; contains 10 p. c. by weight of absolute orthophosphoric acid, sp. gr. 1.057. *Assay:* 4.89 Gm. require 10 Cc. potassa V. S. for neutralization (each Cc. corresponding to 1 p. c. of absolute acid). Dose, ♏v–30 (.3–2 Cc.), well diluted.

PROPERTIES.—Tonic, alterative, refrigerant.

USES.—Dyspepsia, hysteria, diabetes, leucorrhœa, low fevers, scrofula, caries of bones, night-sweats, catarrhal affections, jaundice, melancholy, injection for sinuses, scrofulous joints, wash for ulcers.

Acidum Hypophosphorosum Dilutum. Diluted Hypophosphorous Acid, HH_2PO_2.—(Syn., Fr. Acide Hypophosphoreux; Ger. Verdünnte Unterphosphorigesäure.) A liquid composed of about 10 p. c. by weight of absolute hypophosphorous acid, HH_2PO_2, and about 90 p. c. of water.

Manufacture: Heat phosphorus with solution of potassium, sodium, or calcium hydroxide, getting the corresponding hypophosphite, which is decomposed with tartaric acid (K and Na) or oxalic acid (Ca). The

N. F. recognizes this formula: Decompose potassium hypophosphite 208 Gm., dissolved in distilled water 588 Gm., with tartaric acid 300 Gm., dissolved in diluted alcohol 600 Gm.; mix the two solutions, set aside in a cold place twelve hours, then decant liquid, evaporate alcohol (60° C.; 140° F.), cool, add distilled water q. s. to restore original weight of filtrate—$KH_2PO_2 + H_2C_4H_4O_6 = HH_2PO_2 + KHC_4H_4O_6$. It is a colorless, odorless, acid liquid, sp. gr. 1.046, decomposed by prolonged heat into inflammable hydrogen phosphide and phosphoric acid. *Tests:* 1. Hydrogen sulphide T. S. should give neither precipitate nor coloration (abs. lead). 2. Separate portions, neutralized with ammonia water, should not precipitate with ammonium sulphide T. S. (abs. iron), nor with ammonium oxalate T. S. (abs. calcium), nor more than slight turbidity with barium chloride T. S. (abs. phosphoric, sulphuric, oxalic, tartaric acids). *Assay:* 6.6 Gm. should require for neutralization 10 Cc. normal potassa V. S. (each Cc. corresponding to 1 p. c. absolute acid), phenolphtalein indicator. *Impurities:* Lead, iron, calcium, potassium, phosphate, sulphate, oxalate, tartrate. Dose, ♏x–60 (.6–4 Cc.).

PROPERTIES AND USES.—Tonic, mostly in combination with strychnine, quinine, iron; nervous debility. In pharmacy as a preservative to prevent decomposition of iodides in solution when exposed to light and air. A 50 p. c. acid is also made by simply evaporating official acid to one-fifth of its weight, sp. gr. 1.406.

Halogens or *Haloids.*—Chlorine, Bromine, Iodine, Fluorine. This group of four elements is one of very great importance to medicine and pharmacy. The word halogen is from Gr. ἅλς, the sea, in reference to their original source; thus chlorine is from sea-salt, bromine from sea-water, and iodine from seaweed, besides this they all have atomic weights of a common ratio, chlorine = 35.4, bromine 79.8, iodine 126.6, fluorine 19, which compared with the latter is as 1, 7, 4, 2, or 35.4 + 126.6 ÷ 2 gives 81, which is approximately the atomic weight of bromine. Besides this they are very active in their chemical affinities and produce a vast number of useful compounds.

CHLORINE.

$Cl^i = 35.4.$

The element chlorine (Gr. χλωρός, light-green; *i. e.*, color of the gas) is a greenish-yellow suffocating gas, and as such is mainly useful for a reagent in the laboratory and for bleaching, deodorizing or disinfecting. It is not official, but many of its compounds are.

Aqua Chlori. Chlorine Water.—(Syn., Br. Liquor Chlori, Solution of Chlorine, Chlorum Solutum, Aqua Oxymuriatica; Fr. Eau chlorée, Chlore liquide; Ger. Aqua Chlorata, Chlorwasser.) An aqueous solution of chlorine (Cl) containing at least 0.4 p. c. of the gas.

Manufacture: Add to manganese dioxide 10 Gm., in a flask, hydrochloric acid 35 Cc., previously diluted with water 25 Cc., heat gently, pass evolved gas through wash-bottle, containing water 50 Cc., then into distilled water 400 Cc. until saturated.—$4HCl + MnO_2 = Cl_2 + MnCl_2 + 2H_2O$. It is a clear greenish-yellow liquid, suffocating chlorine odor, disagreeable chlorine taste, decolorizes litmus and indigo solutions. It is likely to deteriorate, hence should always be freshly made and kept from light and air. *Tests:* Shake with excess of mercury until chlorine odor disappears and the remaining liquid should be but faintly acid (limit, hydrochloric acid). *Assay:* 17.7 Gm. + 1 Gm. KI + 10 Cc. water, the resulting deep-red liquid should require for decoloration 20 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. (corresponding to 0.4 p. c. chlorine)—(1) $2KI + Cl_2 = 2KCl + I_2$. (2) $I_2 + 2(Na_2S_2O_3 + 5H_2O)_2 = 2NaI + Na_2S_4O_6 + 10H_2O$. Dose, ʒj–4 (4–15 Cc.), well diluted.

PROPERTIES.—Stimulant, antiseptic, disinfectant, irritant.

USES.—Typhus fever, liver affections, blood poisoning, scarlatina, fetid bronchitis, malignant sore throat, diphtheria, typhoid diarrhœa, dysentery, smallpox, phthisis. Externally, well diluted as a gargle in smallpox, scarlet fever, putrid sore throat, as a wash for ulcers, cancers, buboes, abscesses, itching in skin diseases, chronic catarrh; applied best by atomizer (ʒss ; 2 Cc. + hot water ℥j ; 30 Cc.).

Poisoning: Give emetic, warm water, albumin, milk, white of egg, flour, lime water.

Incompatibles: Salts of lead and silver.

Acidum Hydrochloricum. Hydrochloric Acid, HCl.—(Syn., Muriatic Acid, Spirit of (Sea) Salt, Marine Acid, Acidum Chlorhydricum, Chlorhydric Acid; Fr. Acide hydrochlorique—chlorhydrique—muriatique; Ger. Salzsäure, Chlorwasserstoffsäure.) A liquid composed of 31.9 p. c. by weight of absolute hydrochloric acid (HCl) and 68.1 p. c. water.

Manufacture: Heat sodium chloride with sulphuric acid, wash evolved HCl gas and pass it into cold water—(1) $2NaCl + H_2SO_4 = 2HCl + Na_2SO_4$. (2) $NaCl + H_2SO_4 = HCl + NaHSO_4$. The latter equation is mostly used, as it forms a more soluble sulphate, which is so easily washed out from the retorts with a stream of water. It is a colorless, fuming liquid, pungent odor, acid taste, sp. gr. 1.163, volatile. *Test:* With silver nitrate T. S. get white curdy precipitate, insoluble in HNO_3, soluble in ammonia water without color (abs. copper, and test of chloride). *Assay:* 3.64 Gm. + 10 Cc. water should require for neutralization 31.9 potassa V. S. (each Cc. corresponding to 1 p. c. of absolute acid), phenolphtalein indicator. *Impurities:* Non-volatile substances, iodine, bromine, arsenic, sulphuric acid, sulphurous acid, lead, thallium, iron, aluminum. Should be kept in a dark-amber-colored glass-stoppered bottle. Dose, ♏ij–5 (.13–.3 Cc.), well diluted.

PREPARATION.—1. *Acidum Hydrochloricum Dilutum.* Diluted Hydrochloric Acid. (Syn., Diluted Muriatic Acid ; Fr. Acide chlorhydrique dilué ; Ger. Verdünnte Salzsäure.)

Manufacture: Mix hydrochloric acid 100 Gm. with distilled water 219 Gm. Contains 10 p. c. of absolute hydrochloric acid, sp. gr. 1.050. *Tests:* Same as for strong acid. *Assay:* 3.64 Gm. should require for neutralization 10 Cc. potassa V. S. (each Cc. corresponding to 1 p. c. of absolute acid). Dose, ♏v–30 (.3–2 Cc.), well diluted.

PROPERTIES.—Tonic, refrigerant, antiseptic, irritant, poisonous. Given before meals checks flow of gastric juice, diminishing acidity, but 2–3 hours after food increase the acidity; increases saliva, bile, pancreatic juice, checks fermentation, moistens mouth, allays thirst; combines with albumin or alkaline base of blood lessening its alkalinity. Long use impairs digestion, constipates.

USES.—Low fevers, phthisis, syphilis, phosphatic deposits, acid dyspepsia, gastro-intestinal indigestion without diarrhœa (after meals), to quench thirst, skin diseases, eczema, psoriasis, diphtheria, stomatitis.

Poisoning: Give alkalies, magnesia, sodium bicarbonate, soap, demulcent drinks, albumin, oil, milk; opium for pain, brandy or whiskey for collapse.

Incompatibles: Oxidizable substances (explosive), alkalies, carbonates, salts of Ca, Pb, Ag, glucosides.

Synergists: Digestive ferments, vegetable bitters, gentian, nux vomica, etc.

BROMUM. BROMINE.

$Br^1 = 79.76$.

(Syn., Brominium; Fr. Brôme; Ger. Brom.)

The element bromine (Gr. βρῶμος, bad smell, stink; *i. e.*, its disagreeable odor) is official, and while in the free state has some uses, yet in the various combinations with metals to form salts is of far greater service in medicine.

Manufacture: It is in sea-water $\frac{1}{175}$ p. c., along with numerous salts; by evaporating the water most of these latter crystallize out, leaving the bromine (bromides) to be obtained from the mother-liquor or bittern, by passing into it chlorine thus liberating bromine, the vapors of which are condensed in cooled receivers, or shake chlorine solution with ether; chlorine decomposes magnesium bromide and the ether dissolves bromine, liberating magnesium chloride; the bromine can now be converted by potash into bromide, from which bromine can be obtained by manganese dioxide and an acid; or the bittern is concentrated to sp. gr. 1.45 then transferred to stoneware stills, adding sulphuric acid and manganese dioxide—(1) $MgBr_2 + 2Cl = MgCl_2 + 2Br$. (2) $MgBr_2 + 2H_2SO_4 + MnO_2 = Br_2 + MgSO_4 + MnSO_4 + 2H_2O$. (3) $2NaBr + 2H_2SO_4 + MnO_2 = Br_2 + Na_2SO_4 + MnSO_4 + 2H_2O$.

It is a dark reddish-brown liquid, giving off brown, suffocating, irritating fumes, very volatile, sp. gr. 2.990, soluble in 30 parts water, readily in alcohol, ether, with decomposition of them. *Tests:* 1. Destroys litmus, and indigo colors; imparts yellow to starch solution. 2. With potassa T. S. should give clear liquid without oily drops separating, and should have no chloroform odor (abs. bromoform or other organic bromine compounds). *Impurities:* Iodine, chlorine, bromoform, other organic bromine compounds. Should be kept cool, in well-stoppered bottles.

PROPERTIES AND USES.—Powerful corrosive irritant, caustic, deodorant, disinfectant, sedative. Used seldom externally, and internally only as bromides, etc.

Acidum Hydrobromicum Dilutum. Diluted Hydrobromic Acid.—(Syn., Acidum Bromhydricum (dilutum); Fr. Acide hydrobromique; Ger. Hydrobromsäure, Bromwasserstoffsäure.) A liquid composed of 10 p. c. by weight of absolute hydrobromic acid (HBr) and 90 p. c. water.

Manufacture: Pour diluted sulphuric acid into hot saturated solution of potassium bromide—$2KBr + H_2SO_4 = 2HBr + K_2SO_4$, or pass H_2S into bromine and water—$10Br + 2H_2S + 4H_2O = 10HBr + H_2SO_4 + S$, or by dissolving tartaric acid 10 parts, and potassium bromide 8, each in water 25, mix, cool—$KBr + H_2C_4H_4O_6 = HBr + KHC_4H_4O_6$. Here acid potassium tartrate is formed, which upon standing crystallizes out, leaving a supernatant 15 p. c. solution of hydrobromic acid. It is a clear, colorless, odorless, acid liquid, volatile, sp. gr. 1.077. *Tests:* 1. With silver nitrate T. S. get yellowish-white precipitate, insoluble in dil. HNO_3, slightly soluble in ammonia water. 2. With copper sulphate T. S. + H_2SO_4 get a deep-red color. *Assay:* 8.08 Gm. should require 10 Cc. potassa V. S. for neutralization (each Cc. corresponding to 1 p. c. of absolute acid), phenolphtalein indicator. *Impurities:* Iodine (with chlorine and chloroform), sulphuric acid ($BaCl_2$), arsenic (with stannous chloride T. S. + tin foil, should not be brown). Should be kept dark, in glass-stoppered bottles. Dose, ʒss–1 (2–4 Cc.), in water or flavored syrup.

PROPERTIES.—Sedative, narcotic, small doses stimulant.

USES.—Very similar to potassium bromide, but does not depress like it. Epilepsy, nervousness, headache, tinnitus aurium, vomiting, whooping-cough, muscular spasms, neuralgia, bronchial coughs, cerebral hyperæmia, insomnia, irritable heart. Pure hydrobromic acid is a colorless gas, pungent, irritating odor, producing dense white fumes in a damp atmosphere.

IODUM. IODINE.

$I^1 = 126.53.$

(Syn., Iodinium; Fr. Iode; Ger. Jod.)

The element iodine (Gr. ἴον, violet, + εἶδος, form, likeness; *i. e.*, from its violet-colored vapor) is official, and occurs in nature combined with the metals sodium, potassium, magnesium, etc.

Manufacture: The greatest source is the ashes of seaweed (kelp), from which it is obtained by washing with water to dissolve the soluble salts; this solution is filtered and evaporated when the less soluble salts, as chlorides, carbonates, and sulphates crystallize out; the mother-liquor, containing sodium and magnesium iodides, is treated with manganese dioxide and sulphuric acid, so that the iodine distils over—(1) $2NaI + 2H_2SO_4 + MnO_2 = I_2 + Na_2SO_4 + MnSO_4 + 2H_2O$. (2) $MgI_2 + 2H_2SO_4 + MnO_2 = I_2 + MgSO_4 + MnSO_4 + 2H_2O$.

It is in heavy bluish-black crystalline plates, metallic lustre, distinctive odor, sharp, acrid taste, sp. gr. 4.948, imparts deep-brown, slowly evanescing stain, and gradually destroys vegetable colors; soluble in 10 parts alcohol, volatile, with purple vapor. *Tests:* With starch gives dark-blue color, and dissolved in chloroform should be clear and limpid (abs. moisture). *Assay:* 0.32 Gm. + 1 Gm. potassium iodide + 20 Cc. water + few drops starch T. S. should require 25 Cc. $\frac{N}{10}$ sodium hyposulphite T. S. to discharge the blue or greenish color (corresponding to 98.85 p. c. pure iodine). *Impurities:* Chlorine, bromine, cyanogen, iodine cyanide, water. Dose, gr. ¼–1 (.016–.06 Gm.).

PREPARATIONS.—1. *Liquor Iodi Compositus.* Compound Solution of Iodine (Lugol's Solution). (Syn., Br. Liquor Iodi Fortis, Strong solution of Iodine, Liniment of Iodine, Liquor Iodinii Compositus; Fr. Soluté ioduré de Lugol; Ger. Lugol'sche Jodlösung.)

Manufacture: 5 p. c. Dissolve iodine 5 Gm., potassium iodide 10 Gm., in distilled water q. s. 100 Gm. Should be kept in glass-stoppered bottles. Dose, ♏j–10 (.06–.6 Cc.); mostly used externally.

2. *Tinctura Iodi.* Tincture of Iodine. (Syn., Tinctura Iodinii; Fr. Teinture d'Iode; Ger. Jodtinktur.)

Manufacture: 7 p. c. Dissolve iodine 7 Gm. in alcohol q. s. 100 Cc., by agitation. Dose, ♏j–5 (.06–.3 Cc.); mostly used externally.

3. *Unguentum Iodi.* Iodine Ointment. (Syn., Unguentum Iodinii; Fr. Pommade d'Iode; Ger. Jodsalbe.)

Manufacture: 4 p. c. Rub iodine 4 Gm., potassium iodide 1 Gm. with water 2 Cc., add gradually benzoinated lard 93 Gm.; avoid metallic spatula.

Unoff. Preps.: Churchill's Tincture of Iodine, 16.5 p. c. (+ potassium iodide 3.3 Gm., water 25, alcohol q. s. 100 Cc.). *Decolorized Tincture of Iodine,* 8.3 p. c. (+ sodium thiosulphate 8.3 Gm., water 10, stronger ammonia water 6.5, alcohol q. s. 100 Cc.).

PROPERTIES.—Antiseptic, counter-irritant, causing itching, smarting of the skin, corrosive, alterative, absorbent. Rapidly absorbed by mucous membranes, in the blood combined with sodium; eliminated by urine, saliva, milk, intestinal and nasal mucous membranes.

USES.—Mostly externally; enlarged glands, chronic abscesses, swollen joints, chilblains, ringworm, chronic pneumonia, lung affections, boils, carbuncles, suppurating glands, hydrocele, ovarian dropsy, hernia, dropsy of the joints, large chronic bronchocele, chronic abscesses, fistulæ, carbuncles, poisoned wounds of venomous serpents, bites of rabid animals, hydrocephalus, chronic dysentery, diarrhœa.

Poisoning: Give starch, flour, arrowroot mixed with water, vomit, sodium bicarbonate, hypodermic ammonia, strychnine, digitalis, alcohol, atropine.

Incompatibles: Ammonia, mineral acids, metallic salts, alkaloids, forming with most of these insoluble compounds. Iodides with mineral acids, acid salts, bismuth subnitrate, alkaloids, silver nitrate, soluble lead salts, potassium chlorate, spirit nitrous ether, liquorice.

Syrupus Acidi Hydriodici. Syrup of Hydriodic Acid.—(Syn., Fr. Sirop d'Acide iodhydrique ; Ger. Jodwasserstoffsirup.)

Manufacture: Dissolve potassium iodide 1.3 Gm., potassium hypophosphite .1 Gm. in water 1.5 Cc., dissolve tartaric acid 1.2 Gm. in diluted alcohol 2.5 Cc., mix, shake, cool, filter, evaporate to 5 Gm., add syrup q. s. 100 Gm. This is a syrupy liquid containing about 1 p. c. by weight of absolute hydriodic acid (HI) or about 1.3 Gm. in 100 Cc. *Tests:* 1. Should contain no free iodine (starch test). 2. With silver nitrate T. S. should get a pale-yellow precipitate which is nearly insoluble in ammonia water. Dose, ʒj (4 Cc.), well diluted.

USES.—This is a good substitute for iodine and the iodides, being less offensive to the stomach and taste. Chiefly as an alterative in scrofula, chronic bronchitis, malarial poisoning, etc.

II. METALS AND THEIR COMPOUNDS (SALTS).

These are treated also in natural groups, which associate those together having the strongest points of relationship. Thus in regular sequence we have :

LIGHT METALS.

Alkali Metals.	*Alkaline Earth Metals.*	*Earth Metals.*
K, Na, Li, (NH_4).	Ba, Ca, Sr, (Mg).	Al, and some rare metals.
Oxides, carbonates, and most salts soluble.	Oxides soluble, carbonates insoluble.	Oxides insoluble.

HEAVY METALS.

Iron Group.	*Lead Group.*	*Arsenic Group.*
Fe, Mn, Cr, Co, Ni, Zn.	Cd, Pb, Cu, Bi, Ag, Hg.	As, Sb, Sn, Au, Pt, Mo.
Sulphides soluble in dilute acids.	Sulphides insoluble in dilute acids.	
	Sulphides insoluble in ammonium sulphide.	Sulphides soluble in ammonium sulphide.

POTASSIUM (KALIUM).

$K^1 = 39.$

Potassium (L. for potash—*pot* + *ash ; i. e.*, origin of the salts by evaporating wood-ash lye in pots ; Ar. *Kali*, L. *Kalium*, ashes) occurs in nature, to a great extent, as a double silicate of potassium and aluminum (granitic rocks, feldspar, etc.), also as chloride, nitrate, bitartrate, and carbonate, the latter being the predominant salt in wood-ashes. The metal is obtained by heating this carbonate with carbon in iron retorts, passing the evolved vapors into coal-oil in order to condense the metal—$K_2CO_3 + 2C = 2K + 3CO$. Plants derive much of their potassium from these disintegrated rocks, containing the silicate, which is absorbed by the falling rain, this percolates through the soil and from that the plant-roots (rootlets, trichomes) in turn take it. Potassium, however, occurs in the native wood itself, chiefly as the acetate, but to some extent as sulphate, chloride, tartrate, citrate, etc., most of which upon incineration become converted into the carbonate.

Tests for Potassium Salts: 1. With platinic chloride, alcohol and HCl get a yellow, crystalline precipitate ($PtCl_4 2KCl$). 2. With strong solution of tartaric acid get a white crystalline precipitate of cream of tartar—alcohol facilitates the precipitation. 3. The flame of a Bunsen burner is colored violet, which can be recognized, even though sodium be present, through the intervention of blue glass or indigo solution. 4. Potassium salts are soluble in water, non-volatile, and usually white.

Potassii Carbonas. Potassium Carbonate, K_2CO_3.—(Syn., Carbonas Potassicus (Kalicus), Potassii Carbonas Purus, Sal Tartari, Salt of Tartar; Fr. Carbonate de Potasse; Ger. Kalium Carbonicum (Carbonat) Purum, Kohlensaures Kali.)

Manufacture: This is obtained by percolating the wood-ashes with water, which takes up the potassium carbonate with a little chloride, sulphate, and sodium, while calcium and magnesium carbonates, phosphates, and sulphates, together with silica, are left behind. This percolate (lye) is evaporated, giving us *crude potash*, which, by calcining, becomes *pearl-ash*, and this in turn purified yields the official carbonate. It can also be made from the native chloride by Leblanc's process, and likewise from the purer bicarbonate by heat—$2KHCO_3 = K_2CO_3 + H_2O + CO_2$. It is a white, odorless, alkaline powder, very deliquescent. *Tests:* Gives violet flame, and effervesces with acids. *Assay:* 0.69 Gm. should require 9.5 Cc. normal H_2SO_4 for neutralization (each Cc. corresponding to 10 p. c. of pure salt), methyl-orange indicator. *Impurities:* Sulphate, chloride, nitrate, sulphide, cyanide, hyposulphite, sodium, iron, earthy and other metals. Should be kept in well-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.); locally in solution (2 p. c. + water), or ointment (2–12 p. c. + lard).

PREPARATIONS.—1. *Potassa Sulphurata*, 33 p. c. Dose, gr. 3–10 (.2–.6 Gm.).

2. *Mistura Ferri Composita*, $\frac{8}{10}$ p. c. Dose, ℥j–2 (30–60 Cc.).

3. *Pilulæ Ferri Carbonatis*, gr. 1¼ (.075 Gm.) in each pill. Dose, 1–3 pills. In these by double decomposition ferrous carbonate is formed.

USES.—Chiefly in the preparation of the other potassium salts, also as an antacid in dyspepsia, diuretic in dropsy, antilithic in uric acid gravel, jaundice; externally in cutaneous affections, caustic, irritant poison.

Antidotes: Fixed oils, vegetable acids, lemon juice, vinegar, demulcents.

Allied Salt:

Potassii Carbonas Impura. Impure Carbonate of Potassium.—Official, 1830–1860 (pearl-ashes, pearl-ash).

This is simply the crude potash salts, black salts, derived from the evaporated lye of wood-ashes, subjected to direct flame in an oven-shaped furnace. By this means all combustible impurities are burnt out and the mass from being black becomes of a bluish-white color. It is still official in Germany as Kalium Carbonicum Crudum, Pottasche.

Potassii Bicarbonas. Potassium Bicarbonate, $KHCO_3$.—(Syn., Acid Carbonate of Potassium, Kali Carbonicum Acidulum, Bicarbonas Potassicus (Kalicus); Fr. Bicarbonate de Potasse; Ger. Kalium Bicarbonicum (bicarbonat), Doppelt-Kohlensaures Kali.)

Manufacture: Pass carbon dioxide through strong solution of potassium carbonate, when the less soluble bicarbonate precipitates—$K_2CO_3 + H_2O + CO_2 = 2KHCO_3$. It is in colorless, transparent, monoclinic, odorless prisms, saline, alkaline taste, permanent, soluble in 3.2 parts water, almost insoluble in alcohol. *Assay:* 1 Gm. should require 10 Cc. normal H_2SO_4 for neutralization (corresponding to 100 p. c. pure salt), methyl-orange indicator. *Impurities:* Carbonate, chloride, iron, and other metals. Should be kept in well-stoppered bottles.

PREPARATIONS.—1. *Potassii Citras Effervescens,* 45 p. c. Dose, gr. 5–60 (.3–4 Gm.).

2. *Liquor Potassii Arsenitis,* 2 p. c. (+ arsenous acid 1 p. c.). Dose, ♏iij–5 (.2–.3 Cc.).

3. *Liquor Potassii Citratis,* 8 p. c. of bicarbonate. Dose, ℥ss–2 (15–60 Cc.).

4. *Liquor Magnesii Citratis.* 39 gr. (2.5 Gm.) of bicarbonate to each bottle. Dose, ℥vj–12 (180–360 Cc.).

USES.—As the purest source of the potassium salts, similar to carbonate, but has milder taste and is more acceptable to the stomach. Used in beverages, laxative draughts, etc.

Potassa. Potassa, KOH.—(Syn., Potassium Hydrate, (Hydroxide), Caustic Potash, Kali Hydricum Fusum,- (Purum), Oxydum Potassicum, Lapis Causticus Chirurgorum; Fr. Potasse caustique (fondue), Pierre à Cautère; Ger. Kali Causticum Fusum, Kalium-hydroxyd, Aetzkali.)

Manufacture: Evaporate liquor potassæ to dryness, then pour into moulds and quickly bottle to prevent deliquescence. It may also be made by action of the metal potassium on water, and evaporating—$K + H_2O = KOH + H$.

It is in dry, white translucent pencils or fused masses, hard, brittle, fracture crystalline, odorless, lye odor, acrid, caustic taste. Must be handled and tasted with much care, as it quickly destroys organic tissue; on exposure rapidly absorbs CO_2 and moisture (deliquesces). *Assay:* 0.56 Gm. should require 9 Cc. of normal H_2SO_4 for neutralization (each Cc. corresponding to 10 p. c. of pure potassium hydrate), phenolphtalein indicator. *Impurities:* Organic matter, arsenic, lead, iron, aluminum, soda, calcium, chlorides, sulphates, silicates, carbonates, nitrates. Should be kept in well-stoppered bottles made of hard glass. Dose, gr. 1–2 (.06–.13 Gm.), well diluted.

PREPARATIONS.—1. *Liquor Potassæ.* Solution of Potassa. (Syn., Solution of Potassium Hydrate, Kali Hydricum Solutum, Lixivium Causticum; Fr. Potasse caustique liquide, Lessive caustique; Ger. Liquor Kali Caustici, Kalilauge, Aetzkalilauge.)

Manufacture: 5 p. c. Lime 4 Gm., slake, adding distilled water 43 Cc., boil, adding potassium bicarbonate 8.5 Gm. previously dissolved in boiling distilled water 40 Cc., boil ten minutes, add distilled water q. s. 100 Cc., strain—$K_2CO_3 + Ca(OH)_2 = 2KOH + CaCO_3$; or may be made by dissolving potassa 5.6 Gm. in distilled water 94.4 Gm. It is a clear, colorless, odorless aqueous solution of potassium hydrate (KOH) containing about 5 p. c. of the hydrate, taste acrid, caustic, reaction alkaline, sp. gr. 1.036. *Assay:* 28 Gm. require 25 Cc. normal H_2SO_4 for neutralization (each Cc. V. S. indicating 0.2 p. c. absolute KOH). Dose, ♏v–30 (.3–2 Cc.), well diluted.

2. *Potassa Cum Calce.* Potassa with Lime. (Syn., Pulvis Causticus Cum Calce, Pulvis Causticus Viennensis, Vienna Caustic or Paste; Fr. Caustique (Poudre) de Vienne; Ger. Wiener Aetzpulver.)

Manufacture: Rub together in a warm (to prevent taking up moisture) iron mortar, potassa 50 Gm. and lime 50 Gm. It is only a mechanical mixture in grayish-white powder, deliquescent, alkaline reaction. Responds to tests for calcium and potassium; soluble in diluted HCl. Keep in well-stoppered bottles.

PROPERTIES.—Potassa is one of our strongest caustics or escharotics, destroys tissues by abstracting moisture and dissolving albumin, fibrin, and gelatin. Its action differs from silver nitrate in not being superficial but penetrates deeply.

Internally, before meals stimulates acid secretions, at the end or after meals neutralizes gastric juice already secreted; renders blood alkaline in which it circulates possibly as carbonates; renders urine alkaline, increasing its power of holding uric acid in solution, promotes waste, bronchial secretions, checks saliva.

USES.—To cauterize chancres, poisoned wounds, ingrown nails, scrofulous abscesses, carbuncles, tumors, varicose veins, diphtheria, urethral stricture, corns. Internally as an antacid in acid dyspepsia, calculous disorders. Potassa cum calce is the same as potassa, only it is weaker, slower in action and less deliquescent. Liquor potassæ is for the same purposes, but much milder than either of the other two.

Poisoning: Have burning heat in throat, vomiting, diarrhœa, abdominal pain, feeble quick pulse, cold clammy skin, tongue, lips and throat swollen, soft, red. Give emetics, or wash out stomach, weak acids, lemon juice, vinegar, demulcents, oils, flaxseed tea, egg-white.

Incompatibles: Acids, acid salts, metallic salts, preparations of ammonia, belladonna, hyoscyamus and stramonium (alkaloids being decomposed, and all alkaloids being precipitated by alkalies).

Potassa Sulphurata. Sulphurated Potassa.—(Syn., Liver of Sulphur, Sulphuret of Potassium, Hepar Sulphuris; Fr. Sulfure de Potasse, Foie de Soufre; Ger. Kalium Sulfuratum, (Kali) Schwefelleber.)

Manufacture: Sublimed sulphur 100 Gm., potassium carbonate, dried, 200 Gm., mix, heat until fused, pour on a cold marble slab,—$3K_2CO_3 + S_8 = 2K_2S_3 + K_2S_2O_3 + 3CO_2$.

This is not a definite chemical compound, being a mixture of sulphide (K_2S_3) and thiosulphate ($K_2S_2O_3$); occurs in irregular liver-colored pieces, by exposure, absorbs water (moisture), oxygen, and CO_2, becoming greenish-yellow, finally a gray mass, containing potassium carbonate, hyposulphite and sulphate; has odor of H_2S and a bitter, alkaline taste. Dose, gr. 3–10 (.2–.6 Gm.). Applied externally in lotion, bath, ointment.

PROPERTIES.—Irritant, increases pulse, skin heat, and mucous secretions. Large doses are sedative, laxative.

USES.—Chronic rheumatism, gout, cutaneous affections, painters' colic, asthma, chronic catarrh, infantile croup, paralysis, scabies, scrofula, chronic bronchitis, whooping-cough, ascarides by injection.

Potassii Acetas. Potassium Acetate, $KC_2H_3O_2$.—(Syn., Sal Diureticus, Terra Foliata Tartari, Acetas Potassicus (Kalicus); Fr. Acétate de Potasse; Ger. Kalium Aceticum, Kaliumacetat, Essigsaures Kali.)

Manufacture: Saturate pure acetic acid with potassium carbonate (or bicarbonate), evaporate the solution to dryness and fuse—(1) $K_2CO_3 + 2HC_2H_3O_2 = 2KC_2H_3O_2 + H_2O + CO_2$. (2) $KHCO_3 + HC_2H_3O_2 = KC_2H_3O_2 + H_2O + CO_2$. It occurs in white powder or crystalline mass, of satiny lustre, odorless, saline taste, soluble in 0.36 part water, 1.9 alcohol, very deliquescent. *Assay:* 1 Gm. burnt into the carbonate should require 10 Cc. normal H_2SO_4 for neutralization (corresponding to at least 98 p. c. pure potassium acetate), methyl-orange indicator. *Impurities:* Carbonate, sulphate, chloride, arsenic, lead, iron, aluminum, organic substances. Should be kept in well-stoppered bottles. Dose, gr. 10–60 (.6–4 Gm.); laxative, ʒij–4 (8–15 Gm.).

PROPERTIES.—Diuretic, diaphoretic, aperient, non-irritating, antiscorbutic; renders urine alkaline, preventing and dissolving uric acid precipitations (gravel).

USES.—Dropsies (not so good as the bitartrate), acute rheumatism, gout, liver trouble, jaundice, congestion of spleen, uterus, and hemorrhoidal vessels, skin diseases, eczema, psoriasis, lepra, febrile affections, to render urine alkaline. All organic acid salts are converted in the stomach into carbonates.

Potassii Citras. Potassium Citrate, $K_3C_6H_5O_7 + H_2O$.—(Syn., Kalium Citricum, Citras Potassicus (Kalicus); Fr. Citrate de Potasse; Ger. Kaliumcitrat, Citronsaures Kali.)

Manufacture: Saturate to neutrality a solution of citric acid with potassium carbonate (or bicarbonate), filter, evaporate, granulate—(1) $3K_2CO_3 + 2H_3C_6H_5O_7,H_2O = 2K_3C_6H_5O_7,H_2O + 4H_2O + 3CO_2$. (2) $3KHCO_3 + H_3C_6H_5O_7,H_2O = K_3C_6H_5O_7 + 4H_2O + 3CO_2$. It occurs in transparent, prismatic crystals or white, granular powder, odorless, cooling, saline taste, deliquescent, soluble in 0.6 part of water, sparingly in alcohol. *Assay:* 1.79 Gm. burnt into carbonate should require for neutralization 10 Cc. normal H_2SO_4 (corresponding to 100 p. c. pure salt), methyl-orange indicator. *Impurities:* Carbonates, chlorides, sulphates, tartrates. Dose, gr. 10–60 (.6–4 Gm.); mild laxative, ʒj–2 (4–8 Gm.).

Liquor Potassii Citratis. Solution of Potassium Citrate.—(Syn., Mistura Potassii Citratis, Neutral Mixture, Liquor Kali Citrici; Fr. Citrate de Potasse liquide; Ger. Kalium Citrat-Lösung.)

Manufacture: Dissolve potassium bicarbonate 8 Gm. and citric acid 6 Gm., each, in water 50 Cc., filter, mix. It is a clear, colorless, odorless liquid, containing in solution about 9 p. c. of anhydrous potassium citrate, $K_3C_6H_5O_7$, together with small amounts of citric and carbonic acids; taste saline, reaction acid. Dose, ℥ss–2 (15–60 Cc.); should always be freshly made.

Potassii Citras Effervescens. Effervescent Potassium Citrate.

Manufacture: Powder separately citric acid 63 Gm., potassium bicarbonate 90, sugar 47, mix in warm mortar, dry pasty mass rapidly, powder,—$H_3C_6H_5O_7,H_2O + 3KHCO_3 = K_3C_6H_5O_7 + 3CO_2 + 4H_2O$. It is a fine white powder, odorless, sweet, saline taste; soluble in water with effervescence. Should be kept in well-stoppered bottles. Dose, gr. 10–60 (.6–4 Gm.).

PROPERTIES.—Refrigerant, diaphoretic, diuretic, antiscorbutic, arterial sedative, similar to the acetate.

USES.—Febrile affections (this action is increased with sweet spirit of nitre or antimonial wine), remittent, intermittent fevers with hot, dry skin. If given with lemon juice good in rheumatism, uric acid diathesis, acute bronchitis (first stages).

Allied Salt:

Potassii Sulphis. Potassium Sulphite, $K_2SO_3.2H_2O$.—Official, 1870–1890.

Made by passing SO_2 through solution of K_2CO_3 until the CO_2 is expelled, then adding equal weight of K_2CO_3, after which sulphite crystallizes out. It is in opaque octahedral crystals or crystalline powder, odorless, deliquescent, bitter, saline, sulphurous taste.

USES.—Same as sulphites of sodium and magnesium, to which it is inferior. Dose, as a laxative, ʒij–4 (8–15 Gm.).

Potassii Bitartras. Potassium Bitartrate (Cream of Tartar), $KHC_4H_4O_6$.—(Syn., Acid Potassium Tartrate, Supertartrate of Potassa, Crystals of Tartar, Kali Bitartaricum, Bitartras Potassicus (Kalicus), Cremor Tartari; Fr. Bitartrate de Potasse, Pierre de Vin; Ger. Tartarus Depuratus, Weinstein.)

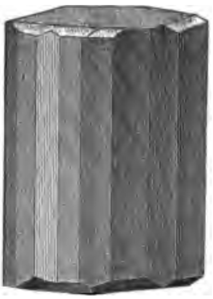
Manufacture: By purifying argol (crude tartar), which deposits in wine casks as a result of fermenting grape juice. This argol is taken from the sides and bottom of the casks, boiled in water, filtered through charcoal, crystallized; can now treat with dil. HCl to remove, as chloride, any calcium tartrate, then heat, crystallize. It occurs in slightly opaque rhombic crystals, or in fine, white, somewhat gritty powder, odorless, acid taste, soluble in 201 parts water, slightly in alcohol. *Assay:* 1.88 Gm. burnt into carbonate should require for neutralization 9.9 Cc. normal H_2SO_4 (each Cc. corresponding to 10 p. c. of pure salt), methyl-orange indicator. *Impurities:* Calcium tartrate, chloride, sulphate, copper, lead, iron, ammonia, insoluble substances. Dose, aperient, gr. 10–60 (.6–4 Gm.); hydragogue cathartic, ʒss–4 (2–15 Gm.); diuretic, gr. 10–60 (.6–4 Gm.), ter die.

PREPARATION.—1. *Pulvis Jalapæ Compositus*, 65 p. c. Dose, gr. 15–60 (1–4 Gm.).

Potassii et Sodii Tartras. Potassium and Sodium Tartrate (Rochelle Salt), $KNaC_4H_4O_6 + 4H_2O$.—(Syn., Tartarated Soda, Natro-kali Tartaricum; Br. Soda Tartarata, Sal Polychrestum, Seignetti, Tartras Potassico-sodicus; Fr. Sel de Seignette, Soude Tartarisée; Ger. Seignettesalz.)

Manufacture: Add potassium bitartrate to hot solution of sodium carbonate, to neutralize free acid, thus obtaining normal double tartrate —$2KHC_4H_4O_6 + (Na_2CO_3 + 10H_2O) = 2(KNaC_4H_4O_6,4H_2O) + CO_2 + 3H_2O$; practically 8 parts cream of tartar + 6 sodium carbonate crystals yield 12 crystallized Rochelle salt. It occurs in colorless, transparent, rhombic prisms, or as white powder, odorless, cooling, saline taste, effloresces; soluble in 2 parts water. *Assay:* 1.41 Gm. burnt to carbonate should require for neutralization 10 Cc. of normal H_2SO_4 (corresponding to 100 p. c. of pure salt), methyl-orange indicator. *Impurities:* Acid potassium tartrate, sulphate, chloride, calcium, arsenic, lead, copper, ammonia.

FIG. 415.



Rochelle salt crystal.

PREPARATION.—1. *Pulvis Effervescens Compositus.* Compound Effervescing Powder (Seidlitz Powder). (Syn., Pulveres Effervescentes Aperientes; Br. Pulvis Sodæ Tartaratæ Effervescens, Effervescent Tartarated Soda Powder; Fr. Poudre gazifère purgative, Poudre de Seidlitz; Ger. Pulvis Aërophorus (Laxans) Seidlitzensis, Abführendes Brausepulver, Seidlitzpulver.)

Manufacture: Sodium bicarbonate gr. 40 (2.6 Gm.), potassium and sodium tartrate gr. 120 (8 Gm.) mixed and put into a blue paper, + tartaric acid gr. 35 (2.3 Gm.) into a white paper. Dose, 1 powder. Dissolve the contents of blue paper in half glass of water, and to this add contents of white paper—drink while effervescing.

PROPERTIES.—Cream of tartar, Rochelle salt, and Seidlitz powders are all diuretic, purgative, refrigerant, antilithic.

USES.—Febrile diseases, dropsy, hemorrhoids, vomiting from gastric acidity and pregnancy. Cream of tartar is thought to escape from the system unchanged, hence not so good when alkalinity desired for blood and urine. Small and frequent doses of Rochelle salt simply make urine alkaline.

Allied Salt:

1. *Potassii Tartras. Potassium Tartrate,* $K_2C_4H_4O_6.H_2O$.—Official, 1880–1890. Made by gradually adding to a solution of potassium carbonate some acid tartrate of potassium until neutral, filter, concentrate, set aside to crystallize—$2KHC_4H_4O_6 + K_2CO_3 = 2K_2C_4H_4O_6, H_2O + CO_2$.

PROPERTIES.—Diuretic, purgative, aperient. More gentle than sodium or magnesium sulphate.

USES.—Hepatic and portal congestion, hemorrhoidal swellings, febrile diseases. Dose, ʒj–8 (4–30 Gm.).

Potassii Chloras. Potassium Chlorate, $KClO_3$.—(Syn., Kali Oxymuriaticum, Kali Muriaticum Oxygenatum, Chloras (Potassicus) Kalicus, Hyperoxymuriate of Potassa; Fr. Chlorate de Potasse; Ger. Kalium Chloricum, Kaliumchlorat, Chlorsaures Kali.)

Manufacture: Pass chlorine into a dry, or a concentrated liquid, mixture of potassium carbonate and slaked lime (milk of lime). When saturated boil the dry or liquid mixture with twice its weight of water, filter, evaporate, crystallize—(1) $3K_2CO_3 + Cl_6 = 5KCl + KClO_3 + 3CO_2$. (2) $K_2CO_3 + 6Ca(OH)_2 + Cl_{12} = 2KClO_3 + 5CaCl_2 + CaCO_3 + 6H_2O$.

If only the potassium carbonate were used we would get 5KCl for every $1KClO_3$ formed (see No. 1 equation), this 5KCl would be lost unless more K_2CO_3 or some cheaper salt be added, hence lime is used, which answers both purposes.

FIG. 416.

Potassium chlorate crystal.

We can use solution of potassa instead of K_2CO_3, when we get the hypochlorite, which by boiling is converted into the chlorate—(1) $6KOH + Cl_6 = 3KClO + 3KCl + 3H_2O$. (2) $3KClO + \text{heat} = KClO_3 + 2KCl$. It occurs in colorless, lustrous, monoclinic prisms, plates, or white powder, odorless, cooling, saline taste; soluble in 16.7 parts water, insoluble in alcohol. *Impurities:* Calcium chloride, lime, sulphate, chloride, nitrate, sodium, ammonia, metals. Should be kept in glass-stoppered bottles, handled cautiously to prevent explosion, and never mixed with cork, tannin, catechu, glycerin, sugar, sulphur, antimony sulphide, phosphorus, etc., nor triturated or heated. Dose, gr. 5–20 (.3–1.3 Gm.).

PREPARATION.—1. *Trochisci Potassii Chloratis.* Troches of Potassium Chlorate. (Syn., Br. Trochiscus Potassii Chloratis; Fr. Tablettes (Pastilles) de Chlorate de Potasse; Ger. Pastillen von Chlorsaurem Kali, Kaliumchlorat-Pastillen.)

Manufacture: Mix sugar 120 Gm., tragacanth 6, spirit of lemon 1

Cc., then to this on a sheet of paper add potassium chlorate 30 Gm., add water q. s. 100 troches. Dose, 1–4 troches.

PROPERTIES.—Alterative, stimulant, oxidizant, irritant, diuretic, poisonous; converts hæmoglobin into methæmoglobin, disintegrates red corpuscles.

USES.—Mercurial salivation and ulcers of the mouth, ulcerated stomatitis, aphthæ, buccal and pharyngeal diphtheria, hemorrhoids, thrush, croup, ozæna, fetid breath, dysentery, vaginitis, cystitis. Internally in scrofula, scarlatina, typhoid fever, cardiac cyanosis, dropsy, blood-poisoning, malignant fevers. Mostly excreted by the kidneys unchanged. If the dose be excessive (ʒij–4; 8–15 Gm.), we have poisonous symptoms, vomiting, diarrhœa, dyspnœa, heart-failure, death. *Poisoning:* Vomit, abundant water, mucilaginous drinks to dilute, opium for pain, amyl nitrite, keep loins warm, avoid renal stimulants.

Potassii Hypophosphis. Potassium Hypophosphite, KH_2PO_2.—(Syn., Kalium Hypophosphorosum, Hypophosphis (Potassicus) Kalicus; Fr. Hypophosphite de Potasse; Ger. Unterphosphorigsaures Kali.) *Manufacture:* Mix solutions of potassium carbonate and calcium hypophosphite, getting double decomposition—$Ca(H_2PO_2)_2 + K_2CO_3 = 2KH_2PO_2 + CaCO_3$, filter from the calcium carbonate, evaporate, granulate. It occurs in white, opaque, hexagonal plates, crystalline masses, or granular powder, odorless, pungent, saline taste, very deliquescent; soluble in 0.6 part water, 7.3 alcohol. Liable to explode by trituration or heating. *Assay:* 0.1 Gm. + 10 Cc. water + 7.5 Cc. H_2SO_4 + 40 Cc. $\frac{N}{10}$ potassium permanganate V. S., then mixture boiled fifteen minutes, it should require 2 Cc. $\frac{N}{10}$ oxalic acid V. S. to discharge red color (corresponding to 98.7 p. c. pure salt). *Impurities:* Calcium carbonate, sulphate, phosphate, chloride. Should be kept in well-stoppered bottles. Dose, gr. 5–30 (.3–2 Gm.).

PREPARATIONS.—1. *Syrupus Hypophosphitum.* Syrup of Hypophosphites. (Syn., Syrupus Calcii Hypophosphitis Compositus; Fr. Sirop d'Hypophosphite de Chaux composée; Ger. Hypophosphitsirup.) *Manufacture:* Calcium hypophosphite 4.5 Gm., potassium hypophosphite 1.5, sodium hypophosphite 1.5, diluted hypophosphorous acid 2, sugar 50, spirit of lemon 0.5 Cc., water q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

> Prep.: 1. *Syrupus Hypophosphitum Cum Ferro.* Syrup of Hypophosphites with Iron. (Syn., Fr. Sirop d'Hypophosphite avec Fer; Ger. Sirup der Unterphosphorigsauren Salz mit Eisen.) *Manufacture:* Rub ferrous lactate 1 Gm., potassium citrate 1, with syrup of hypophosphites q. s. 100 Cc. Should be freshly made when desired, as it deteriorates by age. Dose, ʒj–2 (4–8 Cc.).

USES.—Potassium hypophosphite is thought to be of great advantage owing to the phosphorus. Used in phthisis, depleted nerve-power, scrofulous affections, chronic bronchitis, coughs (expectorant).

Potassii Cyanidum. Potassium Cyanide, KCN.—(Syn., Cyanuret of Potassium, Kalium Cyanatum, Cyanuretum (Potassicum) Kalicum; Fr. Cyanure de Potassium; Ger. Cyankalium, Kaliumcyanid.)

Manufacture: Heat together potassium carbonate and potassium ferrocyanide—$K_2CO_3 + K_4Fe(CN)_6 = 5KCN + KCNO + Fe + CO_2$. The cyanate may be removed by alcohol or carbon disulphide, while the iron (Fe) is precipitated to the bottom of the iron retort, so in pouring out the mass must stop short of any iron contamination.

It is in white, opaque, amorphous pieces or white, granular powder, odorless when dry, if moist smells like hydrocyanic acid, deliquescent; taste sharp, alkaline; soluble in 2 parts water. *Assay:* 0.65 Gm. + 12 Cc. water should require 45 Cc. $\frac{N}{10}$ silver nitrate V. S. before the precipitate becomes permanent (each Cc. of V. S. indicating 2 p. c. pure salt). *Impurities:* Carbonate (HCl), ferrocyanide (Fe_2Cl_6, blue), sulphocyanate (Fe_2Cl_6, red). Should be kept in well-stoppered bottles labeled poison, and handled with great care. Dose, gr. $\frac{1}{16}$–$\frac{1}{8}$ (.004–.008 Gm.), dissolved in water.

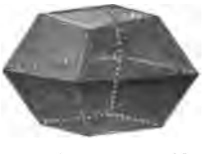
PROPERTIES.—Same as hydrocyanic acid as a poison and medicine. Sedative, anodyne, antispasmodic.

USES.—Headache from dyspepsia or menstruation.

Poisoning: Give recumbent position, fresh air, emetics, atropine as an antidote, stimulants, ether, brandy, warmth, inhale ammonia.

Potassii Ferrocyanidum. Potassium Ferrocyanide, $K_4Fe(CN)_6 + 3H_2O$.—(Syn., (Yellow) Prussiate of Potash, Kalium Borussicum, Cyanuretum Ferroso-potassicum, Ferrocyanuret (Ferroprussiate) of Potassium, Prussiate of Potassa; Fr. Protocyanure jaune de Fer et de Potassium; Ger. (Gelbes) Blutlaugensalz.)

FIG. 417.



Potassium ferrocyanide crystal.

Manufacture: Heat together potassium carbonate (pearl-ash), nitrogenous animal refuse (dried blood, hoofs, etc.), and iron scraps; the fused mass (melt) is lixiviated and this solution evaporated for crystallization—(1) $6KCN + Fe + 2H_2O = K_4Fe(CN)_6 + 2KOH + H_2$, or (2) $6KCN + FeS = K_4Fe(CN)_6 + K_2S$.

It is in large, soft, transparent, 4-sided, monoclinic prisms, odorless, saline taste, efflorescent; soluble in 4 parts water, insoluble in alcohol. *Impurities:* Carbonate, sulphate, chloride, ferricyanide (silver nitrate T. S. should give white precipitate without red tinge). Dose, gr. 10–15 (.6–1 Gm.), ter die.

PREPARATION.—1. *Acidum Hydrocyanicum Dilutum.* Diluted Hydrocyanic Acid (Prussic Acid), HCN. (Syn., Acidum Hydrocyanatum (Borussicum), Cyanhydric Acid; Fr. Acide cyanhydrique (hydrocyanique; Ger. Cyanwasserstoffsäure, Blausäure.) A liquid composed of 2 p. c. by weight of absolute hydrocyanic acid (HCN) and 98 p. c. water.

Manufacture: Potassium ferrocyanide 20 Gm., sulphuric acid 8 Cc., water 65, distilled water about 65. Heat the salt and acid diluted together in a retort, passing the evolved gas into the distilled water.

Extemporaneously: Silver cyanide 6 Gm., hydrochloric acid 5 Cc., distilled water 55, mix and reject the precipitate by quickly filtering or subsidence.

It is a colorless liquid, characteristic odor and taste, like bitter-almonds, very unstable and poisonous; use care in tasting. *Assay:* 0.27 Gm.+10 Cc. water+magnesia for opacity + 2–3 drops potassium chromate T. S., then from a burette add $\frac{N}{10}$ silver nitrate V. S. until the red color is permanent (each Cc. silver nitrate V. S. used indicates 1 p. c. absolute acid). *Impurities:* Sulphuric and hydrochloric acids. Should be kept cool, dark, in small amber, cork-stoppered vials. Dose, ♏j–3 (.06–.2 Cc.), in water or alcohol.

PROPERTIES.—Potassium ferrocyanide—not used much medicinally, although when pure non-poisonous, the commercial salt is sometimes valuable against colliquative sweats of phthisis, also important as a test for copper, zinc, ferric salts and as a source of our cyanogen compounds. Hydrocyanic acid (and all cyanides)—anæsthetic, sedative, anodyne, antispasmodic. On unbroken skin, mouth and stomach paralyzes sensory nerve-endings; small doses slow the heart by stimulating inhibitory centres; large doses may cause diastolic arrest (instantaneous death) by paralyzing the heart directly, and cardiac centre in the medulla. Quickly enters blood, causing all to be bright-red (arterial tint), then going to dark venous color. The venous becomes red owing to its hæmoglobin being oxidized; the arterial becomes dark owing to its oxygen being replaced by carbon dioxide; may produce dermatitis.

USES.—Phthisis, dyspnœa, cough, asthma, whooping-cough, chronic catarrh, nervous cough, angina pectoris, gastralgia, skin diseases.

Poisoning: Symptoms established within a half to two minutes—giddiness, stupor, complete insensibility, eyes fixed, glistening, pupils dilated, dyspnœa, limbs flaccid, skin cold, clammy, respiration slow, deep, convulsive, pulse weak, slow, almost imperceptible, convulsions, paralyzed spine, death from asphyxia (from paralysis of respiratory centre). If possible wash out stomach, emetics, atropine hypodermically, gr. $\frac{1}{50}$ (.0013 Gm.), ether, brandy, ammonia inhalations, artificial respiration and heat, cold water alternately on chest and spine, electricity; ferrous and ferric sulphates, followed by K_2CO_3 solution = insoluble Prussian blue (antidote). Rapidly eliminated by lungs and kidneys.

Incompatibles: Atropine, diffusible stimulants; copper, iron, and silver salts, cobalt nitrate, red mercuric oxide and sulphide.

Synergists: Cardiac and motor depressants.

Potassii Bichromas. Potassium Bichromate, $K_2Cr_2O_7$.—(Syn., Potassium Dichromate, Red Chromate of Potash, Kali Chromicum Rubrum, Bichromas Kalicus; Fr. Bichromate de Potasse; Ger. Kalium Dichromicum, Doppeltchromsaures Kali, Zweifach Chromsaures Kali.)

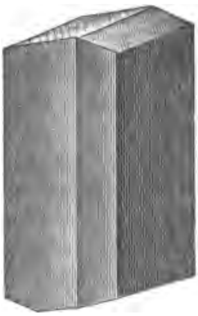
Manufacture: Heat together potassium carbonate, lime, and powdered chrome iron ore which has been previously roasted; the iron is oxidized into ferric oxide, and chromium into chromic acid; this latter attacks the potassium carbonate forming the neutral chromate, which is treated with an acid (H_2SO_4 or HNO_3) to get the acid or bichromate—(1) $2FeOCr_2O_3 + 4K_2CO_3 + O_7 = Fe_2O_3 + 4CO_2 + 4K_2CrO_4$. (2) $2K_2CrO_4 + H_2SO_4 = K_2Cr_2O_7 + K_2SO_4 + H_2O$.

It occurs in large, orange-red, transparent, triclinic prisms, or 4-sided tables, odorless, bitter metallic taste; soluble in 10 parts water, insoluble in alcohol. *Impurities:* Sulphates, chlorides, calcium. Dose, gr. $\frac{1}{5}$ (.0013 Gm.), in pill.

PREPARATION.—1. *Acidum Chromicum.* Chromic Acid, CrO_3. (Syn., Chromic (Chromium) Trioxide, Chromic Anhydride, Anhydrous Chromic Acid; Fr. Acide chromique; Ger. Chromsäure.)

Manufacture: Mix cold saturated solution of potassium bichromate 100 vols., with sulphuric acid 150 vols., let cool; chromic anhydride deposits in crystals—$K_2Cr_2O_7 + 2H_2SO_4 = 2CrO_3 + 2KHSO_4 + H_2O$.

FIG. 418.



Potassium bichromate crystal.

It occurs in small, needle-shaped crystals, or rhombic prisms, dark, purplish-red color, metallic lustre, odorless, destructive to animal and vegetable tissues, deliquescent; soluble in water. *Impurities:* Sulphuric acid, etc. Should be kept in glass-stoppered bottles, out of contact with organic substances, as cork, tannin, sugar, alcohol, ether, glycerin, etc., to avoid explosion, as it readily yields oxygen.

PROPERTIES.—Potassium bichromate—irritant, caustic, alterative, expectorant; Chromic acid—antiseptic, disinfectant, deodorant, coagulates albumin, caustic, escharotic. Action slow but penetrating.

USES. — Potassium bichromate in secondary syphilis; externally as caustic in tubercular enlargements, excrescences, warts, syphilitic sores, sloughing wounds. Largely used in calico-printing, pigments, etc. Workmen in its manufacture are often afflicted with ulcers on hands, face, nares, etc., from the irritating fumes.

Chromic acid is used very similarly as an escharotic for ulcers, bites of rabid animals, poisoned wounds, ozæna, condylomata, nasal polypi, leucorrhœa, gonorrhœa, gangrenous sores, sweating of tender feet.

Poisoning: Large doses produce a violent irritative, corrosive condition; vomiting, hemorrhagic dejections, abdominal pains, poor circulation, coma, heart failure, death. Give emetic, alkaline carbonate (bicarbonate), or magnesia, chalk, demulcent drinks, milk, egg-white.

Potassii Sulphas. Potassium Sulphate, K_2SO_4.—(Syn., Vitriolated Tartar, Tartarum Vitriolatum, Arcanum Duplicatum, Sal Polychrestum Glaseri, Sulfas (Potassicus) Kalicus; Fr. Sulfate de Potasse, Potasse vitriolée; Ger. Schwefelsaures Kali, Kalium (Sulfuricum) Sulfat.)

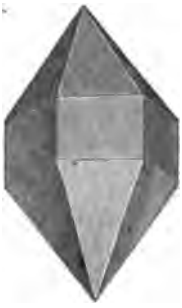
Manufacture: By decomposing potassium carbonate or nitrate or chloride with sulphuric acid, although its greatest source is as a by-product in the manufacture of nitric acid—(1) $K_2CO_3 + H_2SO_4 =$

$K_2SO_4 + H_2O + CO_2$. (2) $2KCl + H_2SO_4 = 2HCl + K_2SO_4$. (3) $2KNO_3 + H_2SO_4 = K_2SO_4 + 2HNO_3$. (4) $KNO_3 + H_2SO_4 = KHSO_4 + HNO_3$. In this last formula the acid sulphate has to be converted into normal sulphate—$2KHSO_4 + K_2CO_3 = 2K_2SO_4 + CO_2 + H_2O$. It is in hard, colorless, transparent, 6-sided, rhombic prisms, terminated by pyramids, or in a white powder, odorless, bitter, saline taste, permanent; soluble in 9.5 parts water, insoluble in alcohol. *Impurities:* Arsenic, lead, copper, zinc, iron, aluminum, sodium, magnesium, calcium, chlorides.

Properties. — Mild purgative, cholagogue, operating usually without pain, heat, or perceptible irritation.

Uses.—Given after labor and for drying up milk, dyspepsia, biliousness, albuminuria. Owing to hardness, it is used for pulverizing tough vegetable substances, like ipecacuanha. Usually prescribed with rhubarb, etc. Dose, ʒss–4 (2–15 Gm.).

Fig. 419.



Potassium sulphate crystal.

Potassii Bromidum. Potassium Bromide, KBr.—(Syn., Bromuretum (Potassicum) Kalicum; Fr. Bromure de Potassium; Ger. Kalium Bromatum, Kaliumbromid, Bromkalium.)

Manufacture: Add bromine to liquor potassæ, thereby producing bromide and bromate, evaporate solution to dryness, mix with charcoal, heat to redness, thus converting all of the bromate into bromide —(1) $6KOH + 6Br = 5KBr + KBrO_3 + 3H_2O$. (2) $2KBrO_3 + 6C = 2KBr + 6CO$. The KBr is dissolved out of the mass with water, and solution allowed to crystallize. This salt can also be made by decomposing bromide of iron with potassium carbonate—$K_2CO_3 + FeBr_2 = 2KBr + FeCO_3$. The iron carbonate is precipitated, while potassium bromide remains in solution. It is in colorless or white cubical crystals, or granules, odorless, pungent, saline taste; soluble in 1.6 parts water, 4 glycerin, 200 alcohol; permanent. *Impurities:* Potassium carbonate, sodium, iron, aluminum, arsenic, lead, copper, calcium, barium, iodine, bromate, sulphate, chloride. Dose, gr. 10–60 (.6–4 Gm.), ter die, in water, elixir, or syrup. In strychnine-poisoning give ʒiij–4 (12–15 Gm.) at once, in tetanus the same amount within twenty-four hours.

Properties.—Sedative, hypnotic, anæsthetic, narcotic, antiseptic, anaphrodisiac. All bromides in the stomach and intestines are quickly converted into sodium bromide, and as such are absorbed. Large doses lessen force and frequency of heart beat, causing stoppage in diastole. Eliminated by kidneys, skin, saliva, milk, intestinal and bronchial mucous membranes.

Uses.—Epilepsy, hysterical, infantile and puerperal convulsions, neuralgia, insanity, delirium tremens, chorea, tetanus, sunstroke, hysteria, whooping-cough, spasmodic asthma, vomiting of phthisis, seasickness, nervousness, angina pectoris, diabetes, seminal emissions, priapisms, incontinence of urine, in teething, toothache, urticaria, acne, intermittent fever, enlarged spleen, amblyopia, diphtheria, to anæsthetize the pharynx, larynx, urethra, irritable bladder, prostate gland, gangrenous sores, strychnine-poisoning. After prolonged use may have *bromism*, which consists of muscular weakness, mental and bodily sluggishness, loss of memory, stupidness, depressed spirits, apathy, low temperature, with patient prostrate in bed, feeble and almost lifeless; fetid breath, coated tongue, and acneiform eruption are its first constitutional symptoms, which can be greatly aborted by Fowler's solution ♏j–5 (.06–.3 Cc.) with every dose of bromine.

Poisoning: Withdraw drug, give diuretics, cathartics, tonics, iron, strychnine, cardiac stimulants, strong coffee, caffeine citrate, digitalis, morphine (best antagonist to mental symptoms), ergot, atropine.

Incompatibles: Motor excitants, cardiac stimulants, acids, acidulous and metallic salts.

Synergists: Opium, hypnotics, cardiac depressants.

Potassii Iodidum. Potassium Iodide, KI.—(Syn., Kali Hydriodicum, Ioduretum (Potassicum) Kalicum; Fr. Iodure de Potassium; Ger. Kalium Jodatum, Kaliumjodid, Jodkalium.)

Manufacture: Add iodine to hot liquor potassæ until dark-brown color is permanent, thus producing iodide and iodate; this solution is evaporated to dryness, mixed with charcoal, and heated to redness, in order to convert all iodate into the iodide—(1) $6KOH + 6I = 5KI + KIO_3 + 3H_2O$. (2) $2KIO_3 + 6C = 2KI + 6CO$. The KI is dissolved out of the mass with boiling water, and solution set aside to crystallize.

It is in colorless, transparent or translucent cubical crystals, or granules, faint iodine odor, pungent, saline, bitter taste, permanent, soluble in 0.75 part water, 18 alcohol, 2.5 glycerin. When crystallized from an alkaline solution it is opaque and less pure. *Assay:* 0.5 Gm. + 10 Cc. water + 2 drops potassium chromate T. S. should require 30.25 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce a permanent red color of silver chromate (corresponding to 99.5 p. c. pure salt). *Impurities:* Iodate, free alkalies, sulphate, nitrite, nitrate, cyanide, sodium, arsenic, lead, copper, iron. Dose, gr. 2–30 (.13–2 Gm.), ter die, largely diluted; in syphilis may give ʒij–4 (8–15 Gm.) daily, well diluted with water, milk or compound syrup of sarsaparilla.

PREPARATIONS.—1. *Unguentum Potassii Iodidi.* Ointment of Potassium Iodide. (Syn., Fr. Pomatum Cum Iodureto Potassico, Pommade d'Iodure de Potassium; Ger. Unguentum Kalii Iodati, Kaliumjodidsalbe, Jodkaliumsalbe.)

Manufacture: 12 p. c. Dissolve potassium iodide 12 Gm. and sodium hyposulphite 1 Gm. in hot water 10 Cc., mix the solution with benzoinated lard 77 Gm.

PROPERTIES.—Alterative, stimulant, absorbent, irritant.

USES.—Specific in rheumatism, nervous diseases, secondary and tertiary syphilis, mercurial tremors and sore mouth, lead poisoning and palsy, aneurism of the aorta, dropsy, granular meningitis, chronic hydrocephalus, brain tumors, priapism, muscular rheumatism, sciatica, angina pectoris, heart diseases, gout, pneumonia, chronic bronchitis, asthma, paralysis, cord sclerosis. When given in large repeated doses produces constitutional symptoms known as *iodism*, preceded by coryza and pain over the brow, sore throat, fetid breath, swollen gums, eruptive acne, neuralgia, emaciation, cardiac palpitation.

Poisoning, Incompatibles: Same as iodine, see page 634.

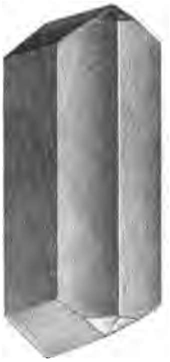
Potassii Nitras. Potassium Nitrate (Saltpetre), KNO_3.—(Syn., Nitre, Nitras (Potassicus) Kalicus, Sal (Petræ) Nitri, Nitrum Depuratum; Fr. Azotate (Nitrate) de Potasse, Nitre prismatique; Ger. Kalium Nitricum, Kaliumnitrat, Salpetersaures Kali, Kalisalpeter.)

Manufacture: While this may be made by neutralizing nitric acid with potassium carbonate, yet by far the most of that used is found in nature as a natural salt of Chili, Peru, India, etc. Some of this supply, however, is a product of nitre beds, which consists of a mechanical mixture of animal refuse, earth and lime, protected under cover. By putrefaction ammonia is formed, which, upon oxidation, becomes nitric acid and unites with the calcium; this is now dissolved out and decomposed with potassium carbonate or chloride—$Ca(NO_3)_2 + K_2CO_3 = 2KNO_3 + CaCO_3$. Saltpetre can also be obtained from Chili saltpetre by double decomposition—$NaNO_3 + KCl = KNO_3 + NaCl$.

It is in colorless, transparent, 6-sided, rhombic prisms, or crystalline powder, odorless, cooling, saline, pungent taste; soluble in 3.8 parts water, slightly in alcohol, when fused into round moulds is called *sal prunelle*, (*nitrum tabulatum*). *Impurities:* Sulphate, chloride, chlorate, calcium, iron, lead, copper, arsenic, zinc, iodine. Dose, gr. 10–30 (.6–2 Gm.).

PREPARATION.—1. *Charta Potassii Nitratis.* Potassium Nitrate Paper. (Syn., Saltpetre Paper; Fr. Papier nitré; Ger. Charta Nitrata, Salpeterpapier.)

FIG. 420.



Potassium nitrate crystal.

Manufacture: Potassium nitrate 20 Gm., distilled water 80 Cc. Into this solution immerse strips of white unsized paper and dry them. Should be kept in well-closed vessels.

PROPERTIES.—Refrigerant, diuretic, diaphoretic, antiseptic, purgative, nervous sedative, cardiac depressant (causing fewer and feebler beats), irritant, alterative; enters blood unchanged; eliminated by kidneys unchanged.

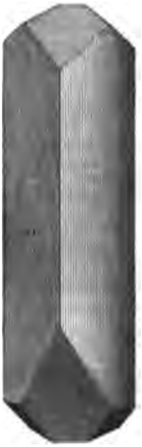
USES.—Acute rheumatism, pneumonia, fevers (acetate and citrate preferable), dropsy, stomatitis, bronchitis, freckles, bruises, abrasions, scurvy, angina, asthma, gout, gonorrhœa, incontinence of urine, making gunpowder. The charta mostly burnt for asthma.

Potassii Permanganas. Potassium Permanganate, $KMnO_4$.—

(Syn., Hypermanganas (Potassicus) Kalicus; Fr. Permanganate de Potasse; Ger. Kalium Permanganicum, Uebermangansaures Kali.)

Manufacture: Fuse manganese dioxide with potassium carbonate (or hydrate) and potassium chlorate (or nitrate). The manganese is converted into manganic acid, which, combining with the alkali, forms potassium manganate; this can be dissolved out by water, giving a dark emerald-green solution, and crystallized. If this solution now be acidified (H_2SO_4) or boiled with much water, it becomes red and contains in solution $KMnO_4$ and a precipitate of MnO_2—(1) $3MnO_2 + 3K_2CO_3 + KClO_3 = 3K_2MnO_4 + KCl + 3CO_2$. (2) $3K_2MnO_4 + 2H_2SO_4 = 2KMnO_4 + 2K_2SO_4 + MnO_2 + 2H_2O$, or $3K_2MnO_4 + 2H_2O = 2KMnO_4 + MnO_2 + 4KOH$. It is in slender, monoclinic prisms, dark-purple color, odorless, taste sweet, afterwards disagreeable, astringent; permanent; soluble in 16 parts water, alcohol decomposes it; decrepitates, yielding oxygen, potassium manganate, and manganese dioxide. *Assay:* 0.1 Gm. + 10 Cc. boiling distilled water + 1 Cc. H_2SO_4 should require for complete decoloration 31.3 Cc. $\frac{N}{10}$ oxalic acid V. S. (corresponding to 98.7 p. c. pure salt). *Impurities:* Potassium carbonate, manganese dioxide, chloride, chlorate, nitrate, sulphate. It should be kept in the dark, in glass-stoppered bottles, out of contact with organic or readily oxidizable substances. Dose, gr. 2–5 (.13–.3 Gm.), given on a full stomach in much water or pill, made with kaolin, soft paraffin, or lanolin.

FIG. 421.



Potassium permanganate crystal.

PROPERTIES.—Disinfectant, deodorant, antiseptic, caustic, stimulant, emmenagogue; liberates much of its oxygen as ozone.

USES.—Externally, fetid and gangrenous ulcers, wounds, abscesses, carbuncles, gonorrhœa, leucorrhœa, otorrhœa, diphtheria, cancerous ulcers, eczema; Internally, diphtheria, scarlatina, atonic amenorrhœa, antidote to morphine, opium (by mouth; of little value by rectum and still less hypodermically), phosphorus, serpents' bites, rabies poisoning. The stains can be resolved by weak acid solutions (oxalic, hydrochloric), lemon juice, etc. It oxidizes to the extent of its own available oxygen, forming harmless compounds.

SODIUM (NATRIUM).

$Na^1 = 23$.

The metallic element sodium (L. *sod-a*, + *ium*, fr. *solidus*, contr. *sodo*, solid, hard, *sod-ash*, residue from burning masses or *sods* of marine plants) is not itself official, but many of its salts are. It is widely diffused in nature in the form of various compounds, occurring in the atmosphere, soil, spring and sea-waters, rock and common salt, mainly as the chloride. We also have the native nitrate and silicate.

All of these are more abundant and soluble than potassium salts, and like them are dissolved by rain water, which, in its onward movement, dissolves and deposits some of them almost everywhere. The metal is obtained similarly to potassium, with which it is closely distributed.

Tests for Sodium Salts.—1. Sodium salts are all soluble in water, consequently cannot be precipitated by any reagent. 2. The main test is that all compounds impart a yellow color to a colorless Bunsen flame, and the spectroscope gives a characteristic yellow line. 3. Sodium compounds are white, soluble in water and non-volatile at a red heat.

Sodii Boras. Sodium Borate (Borax), $Na_2B_4O_7 + 10H_2O$.—(Syn., Sodæ Biboras, Sodium Biborate, Sodium Tetra or Pyroborate, Natrium Biboricum (Biboracicum), Boras Sodicus; Fr. Borate de Soude, Sel de Perse; Ger. Borsaures Natron, Natrium (Pyroborat) Borat.)

Manufacture: This salt, called natively tincal, is found in Thibet, Persia, California, etc., occurring as saline incrustation on lake shores and as crystals in the blue mud of Clear Lake. The large crystals are picked out, washed with soda solution to remove fatty matter, and the saturated earth lixiviated, the solution evaporated and crystallized. Can also be made from the natural borates—boracite, borosodocalcite, cryptomorphite, etc., of Nevada, S. America, Europe, Asia.

FIG. 422.

Sodium borate crystal.

Mostly prepared from crude boric acid of Tuscany by fusing with sodium carbonate—$4H_3BO_3 + Na_2CO_3 = Na_2B_4O_7 + CO_2 + 6H_2O$.

It is in colorless, transparent, monoclinic prisms, or white powder, inodorous, sweet, alkaline taste, effloresces in warm air; soluble in 16 parts water, 1 glycerin; insoluble in alcohol. *Impurities:* Sulphate, chloride, nitrate, phosphate, calcium, arsenic, lead, iron, aluminum. Dose, gr. 5–30 (.3–2 Gm.).

PROPERTIES AND USES.—Identical with boric acid, disinfectant, antiseptic, astringent, dysmenorrhœa, uric acid diathesis, epilepsy, gravel; locally in aphthous ulceration, diphtheria, inflammation of the mouth, infantile diarrhœa, cystitis, ulcers, urethral and vaginal inflammation, scaly skin diseases, prurigo pudendi, leucorrhœa, psoriasis, itching in urticaria, impetigo, pruritus scroti et ani, eczema, conjunctivitis, gonorrhœa.

FIG. 423.

Sodium nitrate crystal.

Incompatibles: Precipitates alkaloids, atropine, cocaine, morphine, quinine, etc., except in presence of glycerin, gelatinizes acacia mucilage, decomposes alkali carbonates with effervescence, in presence of glycerin.

Sodii Nitras. Sodium Nitrate, $NaNO_3$.—(Syn., Cubic Nitre, Nitrum Cubicum, Nitras

(Azotus) Sodicus; Fr. Azotate (Nitrate) de Soude, Nitre cubique; Nitrate de Chili; Ger. Natrium Nitricum, Natriumnitrat, Chili Salpeter.)

Manufacture: Found native in Chili, Peru, etc., then purified by crystallizing from an aqueous solution. It is in colorless, transparent rhombohedral crystals, odorless, cooling, saline, slightly bitter taste, deliquescent, soluble in 1.3 parts water, 100 alcohol. *Impurities:* Sulphate, chloride, iodide, iodate, calcium, potassium, magnesium, arsenic, other metals. Should be kept in well-stoppered bottles. Dose, ʒiv–8 (15–30 Gm.), as a purgative during the day; gr. 15–30 (1–2 Gm.), for other troubles.

PROPERTIES AND USES.—Refrigerant, diuretic, purgative; dysentery, epilepsy, angina pectoris, laryngitis, diarrhœa.

Sodii Nitris. Sodium Nitrite, $NaNO_2$.—(Syn., Fr. Nitrite de Soude; Ger. Salpetrigsaures Natron.)

Manufacture: Heat sodium nitrate, charcoal, and starch together, and wash out nitrite with water, or can add to fused sodium nitrate some pure lead in sheets, then fuse 3½ hours. This mass is lixiviated with water until solution has sp. gr. 1.342, when HNO_3 is added, now concentrate to sp. gr. 1.414, clarify by subsidence, and allow to crystallize.

It is in white opaque fused masses, or pencils, or colorless transparent hexagonal crystals, odorless, saline taste, deliquesces, oxidizes to sodium nitrate. *Assay:* 0.15 Gm. + 5 Cc. water in a nitrometer, then add 1 Gm. KI + 6 Cc. water + 15 Cc. normal H_2SO_4; the liberated nitrogen dioxide gas should be 50 Cc. (corresponding to 97.6 p. c. pure salt). *Impurities:* Iodide, arsenic, copper, lead. Should be kept in well-stoppered bottles. Dose, gr. 2–3 (.13–.2 Gm.), ter die.

PREPARATION.—1. *Spiritus Ætheris Nitrosi.* Spirit of Nitrous Ether. (Syn., Sweet Spirit of Nitre; Br. Spiritus Nitri Dulcis, Spiritus Nitrico Ætherus; Fr. Ether azoteux alcoolisé, Liqueur anodine nitreuse; Ger. Versüsster Salpetergeist.)

Manufacture: Dissolve sodium nitrite 770 Gm. in water 1,000 Cc., put this into a flask, connected with a condenser, cooled by ice-water, having a receiver, surrounded by salt and crushed ice, to flask add deodorized alcohol 550 Cc. and gradually sulphuric acid 520 Gm. previously diluted with water 1,000 Cc., apply gentle heat as needed until all nitrous ether passes over; wash distillate with cold water 100 Cc. to remove alcohol, then with cold water 100 Cc. + Na_2CO_3 10 Gm. to remove traces of acid; separate ether from aqueous liquid, agitate former with K_2CO_3 30 Gm. to remove traces of water, filter through cotton into deodorized alcohol 2,000 Cc.

This is an alcoholic solution of ethyl nitrite, $C_2H_5NO_2$, yielding by the nitrometer 11 times its own volume of nitrogen dioxide, NO. *Assay:* 5 Cc. put into a nitrometer + 10 Cc. potassium iodide T. S. + 10 Cc. normal H_2SO_4, then the NO gas evolved should be 55 Cc. (corresponding to 4 p. c. of pure ethyl nitrite). It is a clear, mobile, volatile, inflammable liquid, greenish-yellow, fragrant, pungent odor, sharp, burning taste, free from acidity; sp. gr. 0.836–0.842. *Impurities:* Aldehyde, acetic acid.

Properties and Uses.—Similar to nitroglycerin and amyl nitrite, but is milder and more uniform; angina pectoris, asthma, dyspnœa, headache, hemicrania, epilepsy; dilates the vessels, lowers blood-pressure. *Spirit*, diffusible stimulant, stomachic, carminative, antipyretic, mainly a diuretic, diaphoretic in febrile conditions, strangury, urinary affections, kidney troubles (Bright's, etc.), flatulency, nausea, nervous agitation, coughing, headache. Dose, for fever, ♏xx–30 (1.3–2 Cc.); as a diuretic, ʒss–1 (2–4 Cc.), in sweetened water.

Incompatibles: Potassium iodide, ferric sulphate, gallic and tannic acids, tincture of guaiacum, emulsions, etc.

Sodii Chloridum. Sodium Chloride, $NaCl$.—(Syn., Common, Table or Sea Salt, Muriate of Sodium, Sal (Commune) Culinare, Chloruretum Sodicum; Fr. Chlorure de Sodium, Hydro-chlorate de Soude, Sel de Cuisine, Sel commun or marin; Ger. Natrium Chloratum (Purum), Natriumchlorid, Chlornatrium, Kochsalz.)

Manufacture: Found native everywhere, being the most abundant sodium compound. For general use it is obtained from the solid rock salt, as occurring in mines, or from sea-water by evaporation. It is in colorless transparent cubical crystals, or white crystalline powder, odorless, saline taste, soluble in 2.8 parts water, insoluble in alcohol, ether, chloroform. *Assay:* 0.195 Gm. + 10 Cc. water + few drops potassium chromate T. S. should require 33.4 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce permanent red color (corresponding to 99.9 p. c. pure salt). *Impurities:* Potassium chloride, magnesium sulphate, iodide, bromide, zinc, calcium, arsenic, lead, iron. Dose, cathartic, ʒij–4 (8–15 Gm.); emetic, ℥ss–1 (15–30 Gm.) in warm water.

Properties and Uses.—Base of all sodium preparations, stomachic, tonic, anthelmintic, purgative, emetic, condiment, preservative, intermittent fever, hemoptysis, phthisis, scrofula, diphtheria, dyspepsia, cholera, worms, ascarides, diabetes, albuminuria, to prevent alcoholic intoxication, congestion of the brain, epilepsy, emetic for narcotics and poisons in stomach, nasal catarrh, ulcers, sore mouth, pruritus, insect stings, toothache, swellings, bruises, rheumatism, salt baths stimulant, for headache, uterine pain, eczema, psoriasis.

Sodii Carbonas. Sodium Carbonate, $Na_2CO_3 + 10H_2O$.—(Syn., Sal Soda, Washing Soda, Carbonas Sodicus, Sal Sodæ Depuratus; Fr. Carbonate de Soude; Ger. Natrium Carbonicum (Crudum), Natriumcarbonat, (Einfach) Kohlensaures Natron.)

Manufacture: Obtained in several ways:

1. *Le Blanc's Process:* (1) $2NaCl + H_2SO_4 = Na_2SO_4 + 2HCl$. (2) $Na_2SO_4 + 4C + CaCO_3 +$ heat $= Na_2CO_3 + CaS + 4CO$. The resulting mass (black-ash) is washed with water dissolving out the Na_2CO_3.

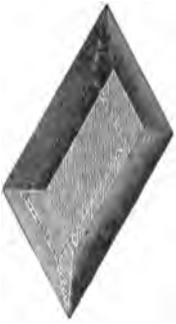
2. *Cryolite Process:* This mineral is found in Greenland, being the double fluoride of aluminum and sodium. (1) $Al_2F_6 6NaF + 6CaCO_3$ + heat $= Al_2O_3, 3Na_2O + 6CaF_2 + 6CO_2$. (2) $Al_2O_3, 3Na_2O + 3CO_2$

$+ 3H_2O = 3Na_2CO_3 + 2Al(OH)_3$. The sodium aluminate is dissolved out by lixiviation with water, and into this solution CO_2 is passed, under pressure, which decomposing, precipitates aluminum hydroxide together with a little Na_2CO_3, while most of the pure Na_2CO_3 remains in solution only to be crystallized out.

3. *Solvay's Process:* (1) $NaCl + 2NH_3 + 3CO_2 + 2H_2O$, under pressure $= NaHCO_3 + NH_4HCO_3 + NH_4Cl$. (2) $NH_4HCO_3 + NaCl = NaHCO_3 + NH_4Cl$. (3) $2NaHCO_3 + \text{heat} = Na_2CO_3 + H_2O + CO_2$.

It is in colorless, monoclinic crystals, odorless, alkaline taste, effloresces, losing one-half of its water of crystallization (31.46 p. c. by weight) becoming a white powder; soluble in 1.6 parts water, 1.02 glycerin, insoluble in alcohol, ether. *Assay:* 1 Gm. anhydrous salt should require 18.7 Cc. normal H_2SO_4 for neutralization (corresponding to 98.9 p. c. pure salt), methyl orange indicator. *Impurities:* Sulphates, chlorides, sulphite, hyposulphite, sulphocyanate, potassium, calcium, ammonia, aluminum, lead, arsenic, iron. Should be kept in well-closed vessels. Dose, gr. 10–30 (.6–2 Gm.), in powder or some bitter infusion.

FIG. 424.



Sodium carbonate crystal.

PREPARATION.—1. *Sodii Carbonas Exsiccatus.* Dried Sodium Carbonate. (Syn., Fr. Carbonate de Soude sec.; Ger. Natrium Carbonicum Siccum, Getrocknete (Entwässerte) Soda.)

Manufacture: Expose sodium carbonate 200 Gm., in broken crystals, for several days to warm air until effloresced, and disintegrated; heat at 45° C. (113° F.) until 100 Gm. It is a loose white powder responding to reaction like sodium carbonate. *Assay:* 1 Gm. should require 13.8 Cc. normal H_2SO_4 (corresponding to 73 p. c. of anhydrous sodium carbonate). Dose, gr. 5–15 (.3–1 Gm.).

2. *Liquor Sodæ Chloratæ,* 15 p. c. Dose, ♏xxx–40 (2–2.6 Cc.).

3. *Massa Ferri Carbonatis,* 42 p. c. ferrous carbonate. Dose, gr. 3–5 (.2–.3 Gm.).

4. *Suppositoria Glycerini,* gr. 4.6 (.3 Gm.), or sodium stearate 10 p. c.

PROPERTIES.—Antacid, irritant, diuretic. Similar to bicarbonate, not much used internally, owing to its corrosive and poisonous action (like soda).

USES.—Gallstones, acid stomach or intestines, gout, uric acid diathesis, rheumatism, skin diseases, burns, scrofula, whooping-cough, liver congestion, vulva pruritus, for making other sodium salts. The dried carbonate is used likewise, having the advantage of being more concentrated.

Poisoning: Give fixed oils, acetic acid, vinegar, lemon juice, demulcents, relieve pain with opium or morphine.

Sodii Bicarbonas. Sodium Bicarbonate, $NaHCO_3$.—(Syn., Natrium Carbonicum Acidulum, Bicarbonas Sodicus, Sodium Hydrocarbonate, Acid Sodium Carbonate; Fr. Bicarbonate de Soude, Sel digestive de Vichy; Ger. Natrium Bicarbonicum, Natrium Bicarbonat, Doppeltkohlensaures Natron.)

Manufacture: 1. ($Na_2CO_3 + 10H_2O$) + $CO_2 = 2NaHCO_3 + 9H_2O$, this is readily effected either in solution or dry.

(2) *Solvay's Process:* $NaCl + NH_3 + CO_2 + H_2O$, under pressure $= NaHCO_3 + NH_4Cl$. It is a white opaque powder, odorless, cooling alkaline taste, permanent, soluble in 11.3 parts water, insoluble in alcohol, ether. *Assay:* 0.85 Gm. should require not less than 10 Cc. normal H_2SO_4 for neutralization (corresponding to 98.6 p. c. pure salt), methyl-orange indicator. *Impurities:* Carbonate, chloride, sulphate, sulphite, hyposulphite, potassium, calcium, arsenic, aluminum, iron, ammonia. Should be kept cool in well-closed vessels. Dose, gr. 5–30 (.3–2 Gm.).

PREPARATIONS.—1. *Trochisci Sodii Bicarbonatis.* Troches of Sodium Bicarbonate. (Syn., Fr. Tablettes (Pastilles) de Bicarbonate de Soude, Pastilles (de Vichy) digestives; Ger. Natronpastillen.)

Manufacture: Triturate nutmeg 1 Gm. with sugar 60, add sodium bicarbonate 20, mucilage of tragacanth q. s. 100 troches. Dose, 1–6 troches.

2. *Mistura Rhei et Sodæ,* 3.5 p. c. Dose, ʒij–16 (8–60 Cc.).

3. *Ferri Carbonas Saccharatus,* 35 p. c. Dose, gr. 5–30 (.3–2 Gm.).

4. *Pulvis Effervescens Compositus,* gr. 40 (2.6 Gm.). Dose, 1 powder.

PROPERTIES.—Antacid, diuretic, slight depressant and sedative.

USES.—Similar to potassium bicarbonate, but more slowly absorbed; dyspepsia, calculus, infantile croup, pneumonia, gravel, suppressed urine, diabetes, acute articular rheumatism, angina, pruritus, tonsillitis, ophthalmia, rhus toxicodendron poisoning, pain from burns, to dissolve diphtheritic membrane.

Incompatibles: Acids, acid salts, bismuth subnitrate.

Soda. **Soda,** NaOH.—(Syn., Sodium Hydrate or Hydroxide, Caustic Soda, Soda Caustica, Natrium (Causticum) Hydricum; Fr. Soude caustique; Ger. Natron, Ætznatron.)

Manufacture: 1. Let metallic sodium burn on water, and evaporate —$H_2O + Na = NaOH + H$.

2. Evaporate liquor sodæ to dryness, pour into moulds, bottle quickly to prevent deliquescence.

It is in dry, white translucent pencils, or fused masses, showing crystalline fracture, odorless, acrid and caustic taste; on exposure rapidly deliquesces, becoming carbonate by absorbing CO_2 and H_2O, soluble in 1.7 parts water, alcohol. *Assay:* To neutralize 0.4 Gm. requires 9 Cc. of normal H_2SO_4 (each Cc. corresponding to 10 p. c. of pure NaOH), phenolphtalein indicator. *Impurities:* Calcium, sulphate, chloride, carbonate, nitrate, silicate, potassium, arsenic, copper, lead, iron, aluminum, organic matter. Should be kept in well-stoppered bottles made of glass and handled carefully, owing to its escharotic properties. Dose, gr. 1–2 (.06–.13 Gm.), well diluted.

PREPARATION.—1. *Liquor Sodæ.* Solution of Soda. Solution of Sodium Hydrate. (Syn., Natrium Hydricum Solution; Fr. Soude caustique liquide, Lessive des Savonniers; Ger. Ætznatronlauge.)

Manufacture: 5 p. c. Lime 5 Gm., slake, adding distilled water 43 Cc., boil, adding gradually sodium carbonate 17 Gm., previously dissolved in boiling distilled water 40 Cc., boil ten minutes, add distilled water q. s. 100 Cc., strain.—$Na_2CO_3 + Ca(OH)_2 = 2NaOH + CaCO_3$; or may be made by dissolving soda 5.6 Gm. in distilled water 94.4 Gm. It is a clear, colorless, odorless, aqueous solution of sodium hydrate (NaOH), containing about 5 p. c. of the hydrate, taste acrid, caustic, reaction alkaline, sp. gr. 1.059. *Assay:* 20 Gm. require 25 Cc. normal H_2SO_4 for neutralization (each Cc. of V. S. indicating 0.2 p. c. absolute NaOH). *Impurities:* Same as in the salt (caustic soda). Dose, ♏v–30 (.3–2 Cc.), well diluted.

PROPERTIES.—Strong escharotic, destroys tissue like potassa, and otherwise just like it only not quite so poisonous.

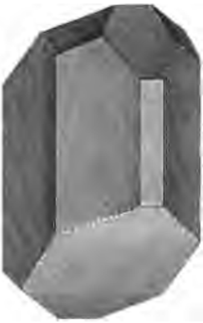
Poisoning, Incompatibles: Same as for caustic potash.

Sodii Acetas. Sodium Acetate, $NaC_2H_3O_2 + 3H_2O$.—(Syn., Acetas Sodicus (Natricus), Terra Foliata Tartari (Crystallisata); Fr. Acétate de Soude; Ger. Natrium Aceticum, Essigsaures Natron.)

Manufacture: Neutralize acetic acid with sodium carbonate or bicarbonate, evaporate, crystallize—$Na_2CO_3 + 2HC_2H_3O_2 = 2NaC_2H_3O_2 + H_2O + CO_2$, or from acetic acid in purifying wood vinegar.

It is in colorless, transparent, monoclinic prisms, or granular crystalline powder, odorless, cooling, saline taste, efflorescent, soluble in 1.4 parts water, 30 alcohol. *Assay:* 1.36 Gm. burnt to carbonate, + water to dissolve, should require 10 Cc. normal H_2SO_4 for neutralization (corresponding to 100 p. c. pure salt), methyl-orange indicator. *Impurities:* Calcium, potassium, arsenic, lead, zinc, iron, chloride, sulphate. Should be kept in well-stoppered bottles.

FIG. 425.



Sodium acetate crystal.

PROPERTIES AND USES.—Diuretic, rarely used in medicine, but to distil with H_2SO_4 for acetic acid. Dose, gr. 15–60 (1–4 Gm.).

Allied Salt:

1. *Sodii Santoninas. Sodium Santoninate,* $2NaC_{15}H_{19}O_4, 7H_2O$.—Official, 1880–1890. Obtained by heating solution of soda 100 Cc., water 30 Cc., santonin 30 Gm. until all dissolved, filter, crystallize. It is in fine felt-like needle crystals or prisms, inodorous, saline, bitter taste, alkaline reaction; soluble in 3 parts water, 12 alcohol. Should be kept in dark-amber-colored, well-stoppered vials, in the dark. Dose, adults, gr. 5–10 (.3–.6 Gm.), twice daily; children, gr. 1–5 (.06–.3 Gm.), with sugar.

PROPERTIES AND USES.—Anthelmintic, lumbricoid worms.

Sodii Benzoas. Sodium Benzoate, $NaC_7H_5O_2$; if in crystals, $NaC_7H_5O_2,H_2O$.—(Syn., Benzoas Sodicus; Fr. Benzoate de Soude; Ger. Benzœsaures Natron, Natrium Benzoat.)

Manufacture: Benzoic acid is added to hot concentrated solution of sodium carbonate (bicarbonate), evaporated, crystallized—$Na_2CO_3 + 2HC_7H_5O_2 = 2NaC_7H_5O_2 + H_2O + CO_2$.

It is a white, amorphous powder, faint odor of benzoin, sweet, astringent taste, permanent; soluble in 1.8 parts water, 45 alcohol. *Assay:* 2 Gm. burnt to carbonate and residue dissolved in 20 Cc. water should require 13.9 Cc. normal H_2SO_4 for neutralization (corresponding to 99.8 p. c. pure salt), methyl-orange indicator. *Impurities:* Lead, iron, potassium, sulphate, chloride. Should be kept in well-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.), ter die.

PROPERTIES AND USES.—Similar to benzoic acid, disinfects and renders alkaline urine acid; gout, rheumatism, phthisis, diphtheria, lithæmia, lithæmic gravel, puerperal fever.

Sodii Bisulphis. Sodium Bisulphite, $NaHSO_3$.—(Syn., Bisulphis Sodicus; Fr. Bisulphite de Soude; Ger. Natrium (Bisulfit) Bisulphurosum, Doppeltschwefligsaures Natron.)

Manufacture: Saturate a solution of sodium carbonate or bicarbonate with SO_2, allow to crystallize in a cool place,—$Na_2CO_3 + 2H_2O + 2SO_2 = 2NaHSO_3 + H_2O + CO_2$.

It is in opaque, prismatic crystals, or granular powder, odor of SO_2, taste disagreeable, sulphurous; on exposure loses SO_2, becoming oxidized into sulphate; soluble in 4 parts water, 72 alcohol. *Assay:* 0.26 Gm. + 20 Cc. water + little starch T. S. should require 45 Cc. $\frac{N}{10}$ iodine V. S. to produce a permanent blue tint (corresponding to 90 p. c. pure salt). *Impurities:* Chloride, sulphate, hyposulphite, arsenic. Should be kept cool in small, well-filled, well-stoppered bottles. Dose, gr. 5–30 (.3–2 Gm.).

PROPERTIES AND USES.—Checks putrefaction, fermentation, yeasty vomiting, aphthous sore throat, to neutralize the chlorine in bleaching fabrics.

FIG. 426.

Sodium hyposulphite crystal.

Sodii Sulphis. Sodium Sulphite, $Na_2SO_3 + 7H_2O$.—(Syn., Sulfis Sodicus (Natricus); Fr. Sulfite de Soude; Ger. Natriumsulfit, Schwefligsaures Natron.)

Manufacture: Saturate a solution of Na_2CO_3 (or NaOH) with SO_2, then add sodium carbonate equal to original amount taken, evaporate, crystallize—$Na_2CO_3 + SO_2 = Na_2SO_3 + CO_2$, or $2NaHSO_3 + Na_2CO_3 = 2Na_2SO_3 + CO_2 + H_2O$.

It is in colorless, transparent, monoclinic prisms, odorless, cooling, saline, sulphurous taste, effloresces, oxidizes to sulphate; soluble in 4 parts water, sparingly in alcohol. *Assay:* 0.63 Gm. + 25 Cc. water

+ little starch T. S. should require 48 Cc. $\frac{N}{10}$ iodine V. S. to produce a permanent blue tint (each Cc. corresponding to 2 p. c. pure salt). *Impurities:* Sulphate, chloride, metals, hyposulphite (with HCl get SO_2, which blackens paper moistened with mercurous nitrate T. S., the solution remains clear, no sulphur being precipitated, if no hyposulphite). Should be kept cool in well-stoppered bottles. Dose, gr. 5–30 (.3–2 Gm.).

Properties and Uses.—Same as the bisulphite. It is one of our most useful antiferments.

Sodii Hyposulphis. Sodium Hyposulphite (Sodium Thiosulphate), $Na_2S_2O_3 + 5H_2O$.—(Syn., Hyposulphis Sodicus, Natrium Hyposulfurosum (Subsulfurosum); Fr. Hyposulphite de Soude, Sulfite sulfuré de Soude; Ger. Unterschwefligsaures Natron, Natriumthiosulfat.)

Manufacture: By boiling solution sodium sulphite with sulphur—$Na_2SO_3 + S = Na_2S_2O_3$, or boiling $6NaOH + S_{12} = Na_2S_2O_3 + 2Na_2S_5 + 3H_2O$, or on larger scale by double decomposition of sodium carbonate with calcium thiosulphate—$Na_2CO_3 + CaS_2O_3 = Na_2S_2O_3 + CaCO_3$. This is not a true hyposulphite ($NaHSO_2$), which, however, can be made thus: $3NaHSO_3 + Zn = NaHSO_2 + Na_2SO_3 + ZnSO_3 + H_2O$. It is in colorless, transparent, monoclinic prisms, odorless, cooling, bitter taste, permanent below 33° C. (91.4° F.) efflorescent above that; soluble in 0.65 part of water, insoluble in alcohol. *Assay:* 0.25 Gm. + 10 Cc. water + few drops starch T. S. should require 9.9 Cc. $\frac{N}{10}$ iodine V. S. to produce permanent blue tint (corresponding to 98.1 p. c. pure salt). *Impurities:* Iron, lead, calcium, caustic alkali or carbonate, sulphate, sulphite or bisulphite (with HCl liberates CO_2 and causes white precipitate of sulphur which neither sulphite nor bisulphite gives), sulphide. Should be kept in well-stoppered bottles. Dose, gr. 5–30 (.3–2 Gm.), also in baths and ointments.

Properties and Uses.—Alterative, resolvent, poison to fungi, arrests fermentation, pyæmia, zymotic disorders, yeasty vomiting, parasitic affections of the skin and mouth, erysipelas, typhus, typhoid fevers, eruptive fevers, yellow fever, diphtheria, purulent infection, intermittent fever, dyspepsia, putrid products, cancers, gangrene, fetid bronchitis, impetigo, sycosis, prurigo pudendi. In the arts, as an antichlor in paper manufacture and in photography to dissolve the unaltered silver chloride or bromide in the film.

Sodii Hypophosphis. Sodium Hypophosphite, $NaH_2PO_2 + H_2O$.—(Syn., Hypophosphis Sodicus; Fr. Hypophosphite de Soude; Ger. Natrium Hypophosphorosum Unterphosphorigsaures Natron.)

Manufacture: Add sodium carbonate to solution of calcium hypophosphite, filter, evaporate, granulate—$Na_2CO_3 + Ca(H_2PO_2)_2 = 2NaH_2PO_2 + CaCO_3$; must evaporate cautiously to avoid the giving off of inflammable phosphoretted hydrogen gas. It is in small colorless, transparent, rectangular plates, pearly lustre, or white granular powder, odorless, saline, bitter-sweet taste, deliquescent, soluble in 1 part water, 30 alcohol. *Assay:* 0.1 Gm. + 10 Cc. water + 7.5 Cc. H_2SO_4 + 40 Cc. $\frac{N}{10}$ potassium permanganate V. S. boiled fifteen minutes, this then should require 3 Cc. $\frac{N}{10}$ oxalic acid V. S. to discharge the red color (corresponding to 97.96 p. c. pure salt). *Impurities:* Carbonate, sulphate, chloride, phosphate, calcium, potassium, iron, arsenic, lead. Liable to explode by heat; should be kept in well-stoppered bottles. Dose, gr. 5–30 (.3–2 Gm.), ter die in water, syrup or mixtures.

PROPERTIES AND USES.—Stimulates the nervous system, increases digestion and nutrition, phthisis, chronic bronchitis, scrofula, syphilis, anæmia, impotence, defect in the osseous system. Generally combined with other hypophosphites, cod-liver oil, etc.

Sodii Bromidum. Sodium Bromide, NaBr.—(Syn., Bromuretum Sodicum; Fr. Bromure de Sodium; Ger. Natrium Bromatum, Natriumbromid, Bromnatrium.)

Manufacture: Similar to potassium bromide, using soda or sodium carbonate with bromine, or by double decomposition between ferrous bromide and sodium carbonate—$Na_2CO_3 + FeBr_2 = 2NaBr + FeCO_3$.

It is in colorless or white cubical crystals, or white granular powder, odorless, saline, bitter taste, soluble in 1.2 parts water, 13 alcohol, absorbs moisture. *Assay:* 0.3 Gm. + 10 Cc. water + 2 drops potassium chromate T. S., this should require 29.8 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce a permanent red color (corresponding to 97.29 p. c. pure salt). *Impurities:* Bromate, sulphate, iodine, potassium, calcium, arsenic, lead, iron, aluminum, moisture. Should be kept in well-stoppered bottles. Dose, gr. 10–60 (.6–4 Gm.) in water, elixir, syrup or powder.

PROPERTIES AND USES.—Resembles potassium bromide very much, only is less irritating to the stomach, and less depressant. Epilepsy, insomnia, delirium tremens, nervous palpitation, nervousness at menopause, sea-sickness.

Poisoning, Incompatibles, Synergists: See potassium bromide, page 648.

Sodii Iodidum. Sodium Iodide, NaI.—(Syn., Fr. Iodure de Sodium; Ger. Natrium (Jodid) Jodatum, Jodnatrium, Natrium Iodatum.)

Manufacture: Add iodine to a solution of soda (or sodium carbonate), or by double decomposition between ferrous iodide and sodium carbonate—$(Na_2CO_3 + 10H_2O) + FeI_2 = 2NaI + FeCO_3 + 10H_2O$.

It is in colorless, cubical crystals, or white crystalline powder, odorless, saline, bitter taste, deliquescent, becoming sodium carbonate and free iodine, soluble in 0.6 part water, 3 alcohol. *Assay:* 0.5 Gm. + 10 Cc. water + 2 drops potassium chromate T. S. should require 34.5 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce a permanent red color (corresponding to 98 p. c. pure salt). *Impurities:* Sulphate, iodate, cyanide, nitrate, nitrite, arsenic, zinc, iron, aluminum, potassium, calcium, free iodine, water. Should be kept in well-stoppered bottles. Dose, gr. 2–30 (.13–2 Gm.), ter die in water, elixir or syrup.

Properties and Uses.—Same as potassium iodide, only is less depressing and irritating. Constitutional syphilis, chronic eczema; with arsenic in lepra, psoriasis, also as a stimulant and antiseptic in foul ulcers, sores, fetor in general.

Poisoning, Incompatibles: See iodine, page 634.

Sodii Salicylas. Sodium Salicylate, $NaC_7H_5O_3$.—(Syn., Fr. Salicylate de Soude; Ger. Natrium Salicylicum [Salicylat].)

Manufacture: Neutralize salicylic acid with sodium carbonate (or bicarbonate), strain, heat to drive off CO_2, evaporate—$Na_2CO_3 + 2HC_7H_5O_3 = 2NaC_7H_5O_3 + H_2O + CO_2$; solution must remain slightly acid, as alkali salicylates, having excess of alkali, absorb oxygen and become colored.

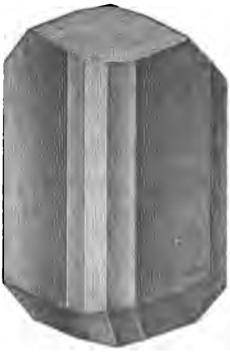
It is a white amorphous powder, odorless, sweet, saline taste, permanent, soluble in 0.9 part water, 6 alcohol. *Impurities:* Carbonate, sulphate, chloride, metals, organic substances. Should be kept dark, cool, in well-stoppered bottles. Dose, gr. 15–30 (1–2 Gm.), ter die, in elixir or water.

Properties and Uses.—Same as salicylic acid (page 432) only not so irritating, and is more rapidly absorbed, it lowers temperature, lessens pain; rheumatism, neuralgia, tonsillitis, dysmenorrhœa, pruritus, whooping-cough, migraine, cholera infantum, diarrhœa, variola, orchitis, rheumatic iritis, biliary colic, acute pleurisy, sciatica, to prevent gallstones, diabetes.

Sodii Arsenas. Sodium Arsenate, $Na_2HAsO_4 + 7H_2O$.—(Syn., Sodii Arsenias, Arsenias Natricus (Sodicus), Arseniate (Arsenate) of Soda; Fr. Arséniate de Soude; Ger. Natrium Arsenat (Arsenicum), Arsensaurus Natron.)

Manufacture: Heat arsenous acid, sodium nitrate and dried sodium carbonate to redness, dissolve fused mass in water, crystallize—$As_2O_3 + 2NaNO_3 + Na_2CO_3 = Na_4As_2O_7 + N_2O_3 + CO_2$. Upon the addition of water to the warm mass, one molecule is appropriated, thereby converting the sodium pyroarsenate into the orthoarsenate, and as such crystallizes upon standing—$Na_4As_2O_7 + 15H_2O = 2(Na_2HAsO_4, 7H_2O)$. It is in colorless, transparent, monoclinic prisms, odorless, mild alkaline taste, very poisonous, efflorescent in dry air, deliquescent in moist air, soluble in 4 parts water. *Impurities:* Lead, copper, iron, arsenite (—2 Cc. aqueous solution (1 in 20) + 5 Cc. $\frac{N}{10}$ silver nitrate V. S., the precipitate dissolved in excess ammonia water, when boiled no black precipitate of reduced silver should appear (abs. arsenite)). Should be kept in well-stoppered bottles. Dose, gr. $\frac{1}{16}$–$\frac{1}{8}$ (.004–.008 Gm.), dried salt gr. $\frac{1}{24}$–$\frac{1}{12}$ (.0025–.005 Gm.).

Fig. 427.



Sodium arsenate crystal.

Preparation.—1. *Liquor Sodii Arsenatis.* Solution of Sodium

Arsenate. (Syn., Solution of Arseniate of Sodium; Fr. Liqueur (Soluté) d'Arséniate de Soude; Ger. Arsensaure Natronlösung.)

Manufacture: 1 p. c. Dissolve sodium arsenate, dried, 1 Gm. in distilled water q. s. 100 Cc.; while this is a substitute for Pearson's Solution, the latter, it must be remembered, is only one-tenth as strong as the official liquor. Should be kept in well-stoppered bottles. Dose, ♏iij–6 (.2–.4 Cc.), diluted.

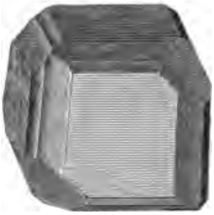
PROPERTIES AND USES.—Identical with liquor potassii arsenitis in strength, but is said to cause poisoning less easily and does not irritate stomach so much. Used in same diseases as arsenous acid—neuralgia, chronic malaria, nervous debility, chorea, eczema, anæmia, etc.

Poisoning: Same as for arsenous acid.

Sodii Chloras. Sodium Chlorate, $NaClO_3$.—(Syn., Chloras Sodicus; Fr. Chlorate de Soude; Ger. Natrium Chloratum [Chlorid, Chloricum].)

Manufacture: Make sodium bitartrate by adding crystals of sodium carbonate 9 parts to tartaric acid 9.5 parts in solution, now add this hot solution to one containing potassium chlorate 8 parts—(1) $Na_2CO_3 + 2H_2C_4H_4O_6 = 2NaHC_4H_4O_6 + H_2O + CO_2$. (2) $NaHC_4H_4O_6 + KClO_3 = NaClO_3 + KHC_4H_1O_6$.

FIG. 428.



Sodium chlorate crystal.

It is in colorless, transparent crystals (regular cubes with tetrahedral facets), or in crystalline powder, odorless, cooling, saline taste, permanent, soluble in 1.1 parts water, 5 glycerin, 100 alcohol. *Impurities:* Sulphate, tartrate, chloride, calcium, potassium, magnesium, aluminum, arsenic, lead, iron. Should be kept in glass-stoppered bottles, handled with great caution, and never mixed with organic matter, as cork, tannin, sugar, sulphur, antimony sulphide, phosphorus, or any oxidizable substance, as explosions may occur, nor should it be heated, triturated or contused for like reason. Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—Same as potassium chlorate, but is more soluble, hence can be used in more concentrated solution.

Sodii Phosphas. Sodium Phosphate, $Na_2HPO_4 + 12H_2O$.—(Syn., Sodium Orthophosphate, Phosphas Sodicus (Natricus), Disodium Hydrogen Phosphate; Fr. Phosphate de Soude; Ger. Natrium Phosphoricum, Natriumphosphat, Phosphorsaures Natron.)

Manufacture: Digest bone-ash with H_2SO_4, which forms acid calcium phosphate—$Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$; filter, heat, add sodium carbonate to the solution, evaporate filtrate, crystallize—$CaH_4(PO_4)_2 + 2Na_2CO_3 = 2Na_2HPO_4 + CaCO_3 + H_2O + CO_2$.

It is in large, colorless, monoclinic prisms, odorless, cooling, saline taste, efflorescent, soluble in 5.8 parts water, insoluble in alcohol. *Impurities:* Calcium phosphate, sulphate, carbonate, chloride, arsenic, potassium, metals, hypophosphite (with silver nitrate T. S. the yellow precipitate should not darken when heated (abs. hypophosphite)).

Should be kept cool, in well-stoppered bottles. Dose, alterative gr. 20–40 (1.3–2.6 Gm.); purgative, ʒij–6 (8–24 Gm.).

PREPARATION.—1. *Ferri Phosphas Solubilis,* 55 p. c. (+ ferric citrate 50 p. c.). Dose, gr. 5–10 (.3–.6 Gm.).

PROPERTIES AND USES.—Hepatic stimulant, mild purgative, alterative, scrofula, rachitis, diabetes, scrofulous ophthalmia, bowel complaint, diarrhœa, jaundice, fevers.

Sodii Pyrophosphas. Sodium Pyrophosphate, $Na_4P_2O_7 + 10H_2O$.—(Syn., Pyrophosphas Sodicus; Fr. Pyrophosphate de Soude; Ger. Natrium (Pyrophosphoricum) Pyrophosphat.)

Manufacture: Heat sodium phosphate to dull redness—$2(Na_2HPO_4 + 12H_2O) = Na_4P_2O_7 + 13H_2O$. It is in colorless, transparent, monoclinic prisms, or crystalline powder, odorless, cooling, saline, feebly alkaline taste, efflorescent in warm air, soluble in 12 parts water, insoluble in alcohol. *Impurities:* Arsenic, potassium, metals, carbonate, sulphate, chloride, orthophosphate (with ammonium molybdate T. S., no precipitate is formed within 15–20 minutes, even if heated (distinction from orthophosphate)). Dose, ʒj–4 (4–15 Gm.).

PREPARATION.—1. *Ferri Pyrophosphas Solubilis,* 50 p. c. (+ ferric citrate 50 p. c.). Dose, gr. 2–5 (.13–.3 Gm.).

PROPERTIES AND USES.—Same as phosphate.

Sodii Sulphas. Sodium Sulphate (Glauber's Salt), $Na_2SO_4 + 10H_2O$.—(Syn., Sulfas Sodicus (Natricus); Fr. Sulfate de Soude, Sel de Glauber; Ger. Natrium Sulfuricum (Sulfat), Glaubersalz.)

Manufacture: As a by-product in making soda-ash, hydrochloric acid, nitric acid, ammonium chloride, carbonated waters, etc.; neutralize residue thus left with sodium carbonate, filter, evaporate, crystallize—$2NaHSO_4 + Na_2CO_3 = 2Na_2SO_4 + CO_2 + H_2O$. It is in large, colorless, transparent, monoclinic prisms, or granular crystals, odorless, bitter, saline taste, efflorescent, finally losing all water of crystallization; soluble in glycerin, 2.8 parts water, insoluble in alcohol. *Impurities:* Arsenic, magnesium, carbonate, chloride, other metals. Should be kept in well-closed vessels. Dose, purgative ʒij–8 (8–30 Gm.).

PROPERTIES AND USES.—Hydragogue cathartic, diuretic; the strongest sodium purgative. When effloresced (dehydrated) it is twice as strong, hence dose must be only one-half. Largely used in veterinary practice, but for man is so harsh that magnesium sulphate is almost always substituted. Used in constipation, plethora, typhoid fever, dysentery, stomach ulcers, to neutralize carbolic acid corrosion, to make sodium carbonate and glass. The bitter, nauseous taste can be overcome by flavoring with aromatic syrup, lemon, etc.

Sodii Sulphocarbolas. Sodium Sulphocarbolate, $NaSO_3C_6H_4(OH) + 2H_2O$.—(Syn., Sodium Paraphenol-sulphonate, Fr. Sulphophénate de Soude; Ger. Phenylschwefelsaures Natron.)

Manufacture: Heat equal weights sulphuric and crystallized carbolic acids for several days at 55° C. (131° F.); this forms paraphenolsulphonic acid (sulphocarbolic acid), which yields clear solution with 20 parts water—$C_6H_5OH + H_2SO_4 = HSO_3C_6H_4OH + H_2O$; to this add gradually barium carbonate 2 parts until effervescence ceases—$2HSO_3C_6H_4OH + BaCO_3 = Ba(SO_3C_6H_4(OH))_2 + H_2O + CO_2$. The $BaSO_4$ deposits, liquid is filtered and the barium sulphocarbolate is decomposed with sodium carbonate solution—$Ba(SO_3C_6H_4(OH))_2 + Na_2CO_3 = 2NaSO_3C_6H_4(OH) + BaCO_3$; evaporate, crystallize.

It is in colorless, transparent, rhombic prisms, odorless, cooling, saline, bitter taste, efflorescent in dry air, soluble in 4.8 parts water, 132 alcohol. *Impurities:* Sulphate, chloride, metals. Dose, gr. 10–20 (.6–1.3 Gm.); mostly in injection, spray, etc.

PROPERTIES AND USES.—Antiferment, phthisis, typhoid fever, eruptive fevers, scarlatina, fermentation, dyspepsia, diarrhœa, gangrene, diphtheria, thrush, vomiting in pregnancy.

LITHIUM.

$L^{i} = 7.$

The metal lithium (Gr. *λίθος*, a stone; *i.e.*, dissolves these in the system, or is found among minerals) is not official, but has several salts which are. It is found sparingly as silicate in a few rare minerals, lepidolite, spodumene, amblygonite, etc., as chloride in soils and spring waters, and as carbonate in plant ashes; it is the lightest metal known, resembles potassium and sodium, and, like them, burns when thrown upon water.

Tests for Lithium Salts.—1. The volatile salts give a vivid red to colorless flame. 2. Lithium compounds in strong solutions give with ammonium carbonate a white precipitate. 3. The neutral or alkaline solutions give with sodium phosphate, on boiling, a white precipitate (Li_3PO_4), soluble in acids and ammonium salts.

Lithii Carbonas. Lithium Carbonate, Li_2CO_3.—(Syn., Carbonas Lithicus; Fr. Carbonate (de Lithine) lithique; Ger. Lithium Carbonicum, Lithiæ Carbonas, Lithiumcarbonat, Kohlensaures Lithion.)

Manufacture: 1. By double decomposition between lithium chloride and ammonium carbonate, filtering, washing with alcohol, drying—$2LiCl + NH_4HCO_3 = Li_2CO_3 + NH_4Cl + HCl$.

2. Fuse together lepidolite 10 parts, barium carbonate 10, barium sulphate 5, potassium sulphate 3. The heavy barium silicate and sulphate subside, while lithium and potassium sulphates come to the surface, the mass is now lixiviated to dissolve the two latter salts, and then by double decomposition with ammonium carbonate we get lithium carbonate.

It is a light white powder, odorless, alkaline taste, permanent; soluble in 80 parts water, in diluted acids with active effervescence, insoluble in alcohol. Imparts crimson color to flame. *Assay:* 0.5 Gm. + 20 Cc. water should require 13.4 Cc. normal H_2SO_4 for neutralization (corresponding to 98.98 p. c. pure salt), methyl-orange indicator. *Impurities:* Calcium, aluminum, iron, arsenic, lead, potassium, sulphate, chloride. Dose, gr. 5–15 (.3–1 Gm.), in carbonic acid water.

PROPERTIES AND USES.—Diuretic to remove uric acid calculi, gout, gouty diathesis, to dissolve false membrane. Best solvent for uric acid, slight depressant, renders urine alkaline.

Lithii Benzoas. Lithium Benzoate, $LiC_7H_5O_2$.—(Syn., Benzoas Lithicus; Fr. Benzoate de (Lithine) Lithium; Ger. Benzoësaures Lithion, Lithium[benzoat]Benzoicum.)

Manufacture: Add benzoic acid to hot solution of lithium carbonate, evaporate, crystallize—$2HC_7H_5O_2 + Li_2CO_3$ + boiling in water = $2LiC_7H_5O_2 + H_2O + CO_2$. It is a light white powder, or in shining crystalline scales, faint benzoin-odor, cooling, sweetish taste, permanent; soluble in 4 parts water, 12 alcohol. *Assay:* 1 Gm. burnt to carbonate, + 20 Cc. water should require 7.8 Cc. normal H_2SO_4 for neutralization (corresponding to 99.6 p. c. pure salt), methyl-orange indicator. *Impurities:* Arsenic, lead, iron, aluminum, calcium, potassium, sulphate, chloride. Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—Diuretic in gout, etc., but no better than citrate and carbonate. Calculous disorders, rheumatism.

Lithii Bromidum. Lithium Bromide, $LiBr$.—(Syn., Bromuretum Lithicum; Fr. Bromure de Lithium; Ger. Bromlithium, Lithium [bromid] Bromatum.)

Manufacture: Heat solution of ferrous bromide with lithium carbonate, evaporate, crystallize—$FeBr_2 + Li_2CO_3 = 2LiBr + FeCO_3$, or can dissolve lithium carbonate in hydrobromic acid.

It is a white granular salt, odorless, sharp, bitter taste, deliquescent, soluble in 0.6 part water, alcohol. *Assay:* 0.3 Gm. + 10 Cc. water + 2 drops potassium chromate T. S. should require 35.3 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce permanent red color of silver chromate (corresponding to 98 p. c. of pure salt). *Impurities:* Arsenic, lead, copper, iron, aluminum, alkalies, potassium, sulphate, iodide. Should be kept in well-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.).

PROPERTIES AND USES.—This is the most hypnotic of all the bromides—epilepsy, gout, etc.

Lithii Citras. Lithium Citrate, $Li_3C_6H_5O_7$.—(Syn., Lithium Citricum; Fr. Citrate de Lithine; Ger. Citron(en)saures (Lithium) Lithion, Lithium [citrat] Citricum.)

Manufacture: Neutralize solution of citric acid with lithium carbonate, evaporate, crystallize—$3Li_2CO_3 + 2H_3C_6H_5O_7 + H_2O$ + boiling in water = $2Li_3C_6H_5O_7 + 4H_2O + 3CO_2$.

It is a white powder, odorless, cooling, alkaline taste, deliquescent, soluble in 2 parts water. *Assay:* 1 Gm. burnt to carbonate, + 20 Cc. water should require 14.2 Cc. normal H_2SO_4 for neutralization (corresponding to 99.2 p. c. pure salt), methyl-orange indicator. *Impurities:* Arsenic, lead, calcium, potassium, iron, sulphate, chloride, other alkalies. Should be kept in well-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.).

PREPARATION.—1. *Lithii Citras Effervescens.* Effervescent Lithium Citrate. (Syn., Fr. Limonade Sèche au Citrate de Lithine; Ger. Brause-lithioncitrat.)

Manufacture: Triturate citric acid 37 Gm. with sugar 20, dry, add lithium carbonate 7 Gm. sodium bicarbonate 28, sugar q. s. 100 Gm. Should be kept in well-stoppered bottles. Dose, ʒj–2 (4–8 Gm.), in water, drank while effervescing, as it is thus rendered more palatable.

PROPERTIES AND USES.—Same as lithium carbonate, being eliminated by the kidneys as such, and has a more pleasant taste, is more soluble and less irritating to the stomach.

Lithii Salicylas. Lithium Salicylate, $LiC_7H_5O_3$.—(Syn., Fr. Salicylate de Lithine; Ger. Lithium[salicylat]Salicylicum.)

Manufacture: Heat salicylic acid (44 parts), and lithium carbonate (12 parts) in water (100 parts) until effervescence ceases, filter, evaporate—$Li_2CO_3 + 2HC_7H_5O_3 = 2LiC_7H_5O_3 + H_2O + CO_2$. It is a white powder, odorless, sweetish taste, deliquescent, very soluble in water, alcohol; contains 95.4 p. c. salicylic acid, and 4.6 p. c. lithium. *Assay:* 2 Gm. burnt to carbonate, + 20 Cc. water should require 13.8 Cc. normal H_2SO_4 for neutralization (corresponding to 99.13 p. c. pure salt). *Impurities:* Arsenic, lead, aluminum, calcium, potassium, organic substances, alkalies, sulphate, chloride. Should be kept in well-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.), in aromatic syrup.

PROPERTIES AND USES.—Rheumatism, gout. Better than sodium salicylate or salicylic acid, this latter being less soluble and more of an irritant to the stomach.

AMMONIUM.

$NH_4^{\prime} = 18.$

There is no metallic ammonium (L. *Ammoni-a* +*um*, fr. (*sal*) *ammoniac*, obtained from near temple of Jupiter Ammon, in Libya, by burning camels' dung); the nearest approach to it, so far, being the ammonium amalgam or alloy made by dissolving potassium in mercury, and adding a strong solution of ammonium chloride, when potassium chloride and ammonium amalgam are formed, this latter being a soft, spongy metallic substance readily decomposing into mercury, hydrogen, and ammonia gas.

Although we have not the metal as represented in these elements thus joined, we nevertheless have many salts consisting of NH_4 in combination with various acids, all of which by physical and chemical properties resemble those of potassium, sodium and lithium.

Tests for Ammonium Salts: 1. All compounds evolve ammonia gas when heated with hydroxide of calcium, potassium or sodium; this is recognized by odor, by restoring reddened litmus paper, by dark-blue with cupric sulphate paper. 2. With platinic chloride + HCl get yellow precipitate. 3. Salts are white, volatile, and soluble in water. 4. In neutral solutions cobaltic nitrite gives yellow precipitate.

Ammonii Benzoas. Ammonium Benzoate, $NH_4C_7H_5O_2$.—(Syn., Ammonium Benzoicum, Ammoniæ Benzoas, Benzoas Ammonicus; Fr. Benzoate d'Ammoniaque; Ger. Benzoësaures Ammonium.)

Manufacture: Dissolve benzoic acid in diluted ammonia water, evaporate, crystallize—$NH_4OH+HC_7H_5O_2=NH_4C_7H_5O_2+H_2O$. It is in thin, white, four-sided laminar crystals, faint odor of benzoic acid, bitter, saline, acrid taste; loses ammonia on exposure, soluble in 5 parts water, 28 alcohol. *Impurities:* Sulphate, chloride. Should be kept in well-stoppered bottles. Dose, gr. 5–30 (.3–2 Gm.), best given in a mixture.

PROPERTIES AND USES.—Stimulant, diuretic, alterative. Due to the benzoic acid, which is absorbed and eliminated by the kidneys as hippuric acid; for defective kidney action, solvent for phosphatic deposits, gouty affections, uric acid gravel.

Incompatibles: Acids, ferric salts, liquor potassæ.

Ammonii Bromidum. Ammonium Bromide, NH_4Br.—(Syn., Fr. Bromure d'Ammonium; Ger. Ammonium Bromatum, Ammonium Bromid, Brom-Ammonium.)

Manufacture: 1. Neutralize hydrobromic acid with ammonia water or carbonate, evaporate, crystallize—1. $HBr + NH_4OH = NH_4Br + H_2O$. 2. $2NH_4OH + FeBr_2 = 2NH_4Br + Fe(OH)_2$. 3. $(NH_4)_2SO_4 + 2KBr = 2NH_4Br + K_2SO_4$; this last is the best method. It is in colorless, transparent, prismatic crystals, or white crystalline powder, odorless, pungent saline taste, permanent, soluble in 1.5 parts water, 30 alcohol. *Impurities:* Iron, metals, sulphate, bromate, ammonium chloride. Dose, gr. 5–30 (.3–2 Gm.), ter die.

PROPERTIES AND USES.—Like potassium bromide, but less depressing upon the arteries and muscles. Epilepsy, neurosis, delirium tremens, whooping-cough, rheumatism, menorrhagia.

Incompatibles: Acids, acid salts, spirit of nitrous ether.

Ammonii Valerianas. Ammonium Valerianate, $NH_4C_5H_9O_2$.—(Syn., Ammonium Valerate; Fr. Valérianate d'Ammoniaque; Ger. Baldriansaures (Valeriansaures) Ammonium, Valerianas Ammonicus.)

Manufacture: Saturate valerianic acid with ammonia gas, *i. e.*, pass gas into solution of the acid until it is neutral, crystallize. It is in white quadrangular plates, odor of valerianic acid, sharp sweet taste, very soluble in water, alcohol, ether, deliquescent, hence should be kept in well-stoppered bottles. *Impurities:* Acetate, sulphate, chloride. Dose, gr. 2–10 (.13–.6 Gm.).

PROPERTIES AND USES.—Hysteria, epilepsy, chorea, neuralgia, nervous headache, insomnia, heart palpitation.

Allied Salt:

1. *Ammonii Phosphas. Ammonium Phosphate,* $2(NH_4)HPO_4$.—Official, 1880–1890. Obtained by adding strong solution of ammonia

to diluted phosphoric acid until alkaline; evaporate, adding ammonia occasionally to continue alkalinity, dry crystals quickly. It is in transparent, colorless, monoclinic prisms, sp. gr. 1.678, odorless, cooling, saline taste, efflorescent, soluble in 4 parts water. Dose, gr. 10–20 (.6–1.3 Gm.), ter die.

PROPERTIES AND USES.—Gout, rheumatism, diabetes.

Ammonii Chloridum. Ammonium Chloride, NH_4Cl.—(Syn., Muriate of Ammonia, Ammonium (Muriaticum) Hydrochloratum Depuratum, Sal (Ammoniacum) Ammoniac, Chloruretum Ammonicum; Fr. Chlorure d'Ammonium, Sel Ammoniac, Chlorhydrate d'Ammoniaque; Ger. Ammonium Chloratum, Ammoniumchlorid, Reiner Salmiak, Chlorammonium.)

Manufacture: 1. Neutralize ammoniacal liquor (gas-liquor) of the gas works (from distillation of coal) with HCl, or decompose by calcium chloride, evaporate solution and sublime the dry mass. 2. Neutralize gas-liquor with H_2SO_4, evaporate solution, crystallize, and then sublime with sodium chloride—(1) $2NH_4OH + H_2SO_4 = 2(NH_4)SO_4 + 2H_2O$. (2) $2(NH_4)SO_4 + 2NaCl = 2NH_4Cl + Na_2SO_4$.

It is a white, crystalline powder, odorless, cooling, saline taste, permanent, soluble in 3 parts water, insoluble in alcohol, volatile when heated. *Impurities:* Barium, calcium, iron, metals, empyreumatic matters, sulphate, sulphocyanate (with hydrochloric acid + ferric chloride T. S., should not be red). Dose, gr. 3–20 (.2–1.3 Gm.).

PREPARATION.—1. *Trochisci Ammonii Chloridi.* Troches of Ammonium Chloride. (Syn., Fr. Tablettes (Pastilles) de Chlorure d'Ammonium (de Sel Ammoniac); Ger. Salmiakpastillen.)

Manufacture: Rub until mixed, ammonium chloride 10 Gm., extract of glycyrrhiza 25, tragacanth 2, sugar 50, form into mass with syrup of tolu q. s. 100 troches. Dose, 1–5 troches.

PROPERTIES AND USES.—Stimulant, irritant, expectorant, acute and chronic bronchitis, catarrhal pneumonia, jaundice, hepatic torpor and engorgement, glandular enlargements, hemicrania, dysmenorrhœa, ovaralgia, sciatica, prostate enlargement, amenorrhœa, uterine tumors, stomach hemorrhage, diabetes, rheumatism, snake-bites, contusions, tumors, ulcers, leucorrhœa, gonorrhœa, gangrene, chronic catarrh; in gargles, dentifrices, errhine powders; disagreeable taste can be disguised by elixir, syrup or fluid extract of liquorice.

Incompatibles: Cardiac depressants, alkalies, alkaline earths and their carbonates, tartaric and mineral acids, soluble lead and silver salts.

Synergists: Expectorants, emetics, diaphoretics.

Allied Salt:

1. *Ammonii Sulphas. Ammonium Sulphate,* $(NH_4)_2SO_4$.—Official, 1870–1890. Obtained by saturating gas-liquor with H_2SO_4, crystallizing. It is in colorless, transparent, rhombic prisms, odorless, sharp, saline taste, permanent, soluble in 1.3 parts water, slightly in alcohol, decomposed by heat. *Impurities:* Iron, lead, chloride.

USES.—Not used itself in medicine but in the manufacture of ammonia water, ammonium chloride, ammonia alum, and sulphate of iron and ammonium.

Ammonii Carbonas. Ammonium Carbonate, $NH_4HCO_3,NH_4NH_2CO_2$.—(Syn., Ammoniæ Sesquicarbonas, Carbonas Ammonicus, Volatile Salt, Sal Volatile (Siccum), Alkali Volatile; Fr. Sel volatile d'Angleterre, Alkali volatil concret, Carbonate d'Ammoniaque; Ger. Ammonium Carbonicum, Ammonium-carbonat, Kohlensaures Ammonium, Flüchtiges Laugensalz, Reines Hirschhornsalz.)

Manufacture: Sublime a mixture of ammonium chloride or sulphate and calcium carbonate—$4NH_4Cl+2CaCO_3=NH_4HCO_3,NH_4NH_2CO_2+2CaCl_2+NH_3+H_2O$. The ammonium sulphate is mostly used on account of cheapness. This carbonate is not normal, $(NH_4)_2CO_3$, but is a double salt, one molecule being acid or bi-ammonium carbonate, and one being ammonium carbamate; the latter dissolved in water soon becomes neutral ammonium carbonate—$NH_4NH_2CO_2 + H_2O = (NH_4)_2CO_3$. If exposed to air gradually loses ammonia and carbon dioxide, and falls into an opaque white powder of acid or bi-ammonium carbonate, NH_4HCO_3. The salt can also be obtained by washing the powdered official carbonate with a little cold water, which dissolves mainly the carbamate, leaving the bi-carbonate undissolved. It is in white, hard, translucent, striated masses, odor strongly ammoniacal, sharp, saline taste, soluble in 5 parts water. The carbamate, $NH_4NH_2CO_2$, is soluble in alcohol, the acid or bi-ammonium carbonate is not. *Assay:* 7.84 Gm. + 90 Cc. water, now 30 Cc. of this solution (containing 2.613 Gm.) should require 50 Cc. of V. S. normal H_2SO_4 for neutralization (each Cc. of V. S. corresponding to 2 p. c. pure salt), rosolic acid indicator. Dose, stimulant, expectorant, gr. 2–3 (.13–.2 Gm.); for fevers, gr. 5–15 (.3–1 Gm.), in solution.

PREPARATION.—1. *Spiritus Ammoniæ Aromaticus*, 3.4 p. c. Dose, ♏xv–60 (1–4 Cc.), well diluted.

PROPERTIES AND USES.—Cardiac stimulant, expectorant, rubefacient, irritant poison; pneumonia, bronchitis, phthisis, hysteria, syncope, typhus and typhoid fevers, scarlatina, measles, erysipelas, bites of venomous serpents, diabetes, headache, nervous spasms, faintness.

Incompatibles: Cardiac sedatives, acids, acid salts, lime water.

Synergists: Cardiac and diffusible stimulants, antispasmodics, capsicum; locally, cantharides, counter-irritants.

Ammonii Nitras. Ammonium Nitrate, NH_4NO_3.—(Syn., Nitrum Flammans, Ammonium Nitricum; Fr. Azotate d'Ammoniaque, Nitre inflammable, Nitre ammoniacal, Sel ammoniacal nitreux; Ger. Salpetersaures Ammon [Ammonium, Ammoniak].)

Manufacture: 1. Neutralize nitric acid with ammonia or ammonium carbonate, filter, evaporate—$NH_4HCO_3,NH_4NH_2CO_2 + 3HNO_3 = 3NH_4NO_3 + H_2O + 2CO_2$. 2. Neutralize gas-liquor with HNO_3 instead of HCl. 3. Double decomposition between ammonium sulphate and potassium nitrate. It is in colorless crystals, or long thin rhombic prisms, or fused masses, odorless, sharp, bitter taste, soluble in 0.5

part water, 20 alcohol, deliquescent, hence should be kept in well-stoppered bottles. *Impurities:* Sulphate, chloride. Dose, gr. 1–20 (.06–1.3 Gm.).

PROPERTIES AND USES.—Very similar to potassium nitrate. It is made official from its being the source of our *nitrous oxide gas* (laughing gas, nitrogen monoxide), which is evolved by simply heating to about 204.4° C. (400° F.) and passing the gas through two solutions —one being either of potassa or lime water, the other of ferrous sulphate, to neutralize acid impurities, and absorb chlorine, ammonia, nitric oxide, etc. ; must always withdraw heat upon the appearance of white fumes in the retort—$NH_4NO_3 = N_2O + 2H_2O$; also used in making freezing mixtures.

Ammonii Iodidum. Ammonium Iodide, NH_4I.—(Syn., Ioduretum Ammonicum; Fr. Iodure d'Ammonium; Ger. Jod Ammonium, Ammonium (jodid) Jodatum.)

Manufacture: Dissolve potassium iodide and ammonium sulphate (from gas-liquor, by neutralizing with H_2SO) in boiling water, add alcohol to precipitate potassium salt, filter, wash, evaporate—$(NH_4)_2SO_4 + 2KI = 2NH_4I + K_2SO_4$. It is in minute colorless, cubical crystals, or white granular powder, odorless when colorless, but odor of iodine when colored, taste sharp, saline, hygroscopic, soon becomes yellowish-brown, owing to loss of ammonia and liberation of iodine, soluble in 1 part water, 9 alcohol. When deeply colored must not be dispensed, unless deprived of free iodine by adding to its concentrated aqueous solution ammonium sulphide T. S. q. s. to render it colorless, filtering, evaporating. *Impurities:* Iron, free iodine, sulphate, chloride, bromide. Should be kept dark, in small, well-stoppered vials, to prevent decomposition and dispensed only in blue bottles. Dose, gr. 2–15 (.13–1 Gm.), in water or syrup. Ointment (5–10 p. c.), used externally.

PROPERTIES AND USES.—Resolvent, resembles potassium iodide very much ; secondary syphilis, chronic rheumatism, incipient phthisis, scrofula, enlarged tonsils, lepra, psoriasis, tinea capitis, enlarged glands.

MAGNESIUM.

$Mg^{ii} = 24$.

The element magnesium (L. *magnesi*(*a*) + *um*, district in Thessaly; also name of two cities in Asia Minor) occupies an intermediate place between metals of the alkalies and alkaline earths, with which latter it was once classed, but now has been separated, owing to its closer recognized analogies to zinc, both having volatile chlorides, soluble sulphates and isomorphous salts.

Magnesium occurs abundantly in nature as chloride and sulphate, in Stassfurt salt-mines, also in numerous spring waters; as carbonate in magnesite; as magnesia calcic carbonate in dolomite (magnesia limestone), which is so profuse in places as sometimes to form the greater bulk of mountain ranges; as silicate in asbestos, meerschaum, serpentine, soapstone, talc, etc.

The metal is obtained by the action of metallic sodium on magnesium chloride—$MgCl_2 + 2Na = 2NaCl + Mg$. It is silver-white, losing lustre by oxidization; when heated to redness yields brilliant white light, and MgO; like potassium and sodium, decomposes hot water —$Mg + 2H_2O = Mg(OH)_2 + 2H$. It is not official, but several of its important salts are.

Tests for Magnesium Salts: 1. With caustic alkalies get gelatinous, white precipitates, insoluble in excess, but soluble in ammonium chloride. 2. With potassium or sodium carbonate + heat get white precipitate of basic carbonate, $4MgCO_3,Mg(OH)_2$. 3. With sodium phosphate + ammonium chloride and ammonia get white crystalline precipitate of magnesium ammonium phosphate, $MgNH_4PO_4$. 4. Salts are white and soluble, except carbonate, phosphate, arsenate; oxide and hydroxide also are insoluble, the latter being precipitated by NaOH or KOH.

Magnesii Sulphas. Magnesium Sulphate (Epsom Salt), $MgSO_4 + 7H_2O$.—(Syn., Sal Amarum—Epsomense—Anglicum or Sedlicense, Sulfas Magnesicus; Fr. Sulfate de Magnésie, Sel d'Epsom, Sel (amer) de Sedlitz; Ger. Magnesium [sulfat] Sulfuricum, Schwefelsaure Magnesia, Bittersalz.)

Fig. 429.

Magnesium sulphate crystal.

Manufacture: 1. Chiefly obtained from Stassfurt, as kieserite ($MgSO_4,H_2O$); heat mineral, dissolve in water, crystallize. 2. By dissolving magnesite (native $MgCO_3$) in dilute sulphuric acid, filtering, crystallizing—$MgCO_3 + H_2SO_4 = MgSO_4 + H_2O + CO_2$. 3. By heating dolomite ($MgCO_3,CaCO_3$) to dissipate CO_2, treating residue with HCl to take up calcium, and dissolving the remaining magnesia in H_2SO_4. It is in small, colorless, rhombic prisms or acicular crystals, odorless, cooling, saline, bitter taste, efflorescent, soluble in 1.5 parts water, insoluble in alcohol. *Impurities:* Iron, zinc, copper, arsenic, sodium, chloride. Should be kept in well-closed vessels. Dose, ℥ss–1 (15–30 Gm.), in cold water or effervescing solution.

PREPARATION.—1. *Infusum Sennæ Compositum,* 12 p. c. Dose, ℥j–3 (30–90 Cc.).

PROPERTIES AND USES.—Cathartic, producing safe, painless, watery stools, refrigerant, diuretic; fevers, inflammatory affections, colic, constipation, dysentery, septic fever, intestinal obstruction, pleurisy, painters' (lead, barium) colic.

Incompatibles: Alkaline carbonates, lime water, phosphoric acid, hosphates, lead acetate, silver nitrate.

Magnesii Carbonas. Magnesium Carbonate, $(MgCO_3)_4, Mg(OH)_2 + 5H_2O$.—(Syn., Carbonicas Magnesicus, Magnesia (Alba) Hydricocarbonica; Fr. Carbonate de Magnésie, Magnésie blanche; Ger. Magnesium [carbonat] Carbonicum, Kohlensaure Magnesia, Weisse Magnesia.)

Manufacture: Mix strong boiling aqueous solutions of magnesium sulphate and sodium carbonate, wash precipitate to remove sodium chloride, dry without heat—$5(MgSO_4+7H_2O)+5(Na_2CO_3+10H_2O) = [(MgCO_3)_4 + Mg(OH)_2 + 5H_2O] + 5Na_2SO_4 + CO_2 + 79H_2O$. If a heavier salt is desired (heavy magnesia), digest the salts in water and evaporate to dryness without filtering, then lixiviate the mass with water to wash out Na_2SO_4, leaving magnesium salt to be dried. It is in light, white friable masses, or light, white powder; odorless, slight earthy taste, permanent, almost insoluble in water, alcohol, soluble in dilute acids with effervescence. *Impurities:* Calcium, sulphate, chloride, metals. Dose, antacid gr. 5–20 (.3–1.3 Gm.); laxative ʒj–2 (4–8 Gm.), in water or milk.

PROPERTIES AND USES.—Antacid, cathartic, antilithic; heartburn, dyspepsia, pregnant vomiting, sick stomach with acidity, excessive uric acid secretion, warts, gout; where potash and soda disagree.

Magnesia. Magnesia, MgO.—(Syn., Light Magnesia, Calcined Magnesia, Magnesia Calcinata; Br. Magnesia Levis; Fr. Magnésie, Magnésie calcinée; Ger. Magnesia Usta, Gebrannte Magnesia.)

Manufacture: Heat official magnesium carbonate to low redness; water and carbon dioxide escape, leaving magnesium oxide—$4(MgCO_3),Mg(OH)_2,5H_2O$ + red heat $= 5MgO + 6H_2O + 4CO_2$. It is a white, very light, fine powder, odorless, earthy taste, not saline, slowly absorbs moisture and carbon dioxide, insoluble in water, alcohol, soluble in dilute acids. *Impurities:* Calcium, other metals, carbonate, sulphate, chloride, water of hydration. Should be kept in well-closed vessels. Dose, antacid, gr. 10 after meals; purgative, gr. 30–60 (2–4 Gm.), added to water or milk; infants gr. 4 (.26 Gm.).

PREPARATIONS.—1. *Ferri Oxidum Hydratum cum Magnesia*, 1¼ p. c. Dose, *ad libitum*.

2. *Pulvis Rhei Compositus*, 65 p. c. Dose, ʒss–1 (2–4 Gm.).

3. *Massa Copaibæ*, 6 p. c. Dose, gr. 15–60 (1–4 Gm.).

PROPERTIES AND USES.—Like the carbonate; antacid, laxative, dyspepsia, sick headache, gout, gravel, heartburn, flatulence, sour eructation, diarrhœa, aphthæ, hemorrhoids, infantile colic, warts, ulcers, abrasions.

Magnesia Ponderosa. Heavy Magnesia, MgO.—(Syn., Heavy Calcined Magnesia, Magnesium Oxide.)

Manufacture: Same way as magnesia, only here the heavy carbonate is heated instead of the light carbonate, or can triturate magnesia with alcohol for some time, dry and powder. It is a white, dense, very fine powder; three and a half times heavier than magnesia and does not, like that, unite readily with water to form gelatinous hydrate. Dose, gr. 5–40 (.3–2.6 Gm.).

Magnesii Citras Effervescens. Effervescent Magnesium Ci-

trate.—(Syn., Magnesii Citras Granulatus; Fr. Limonade sèche au Citrate de Magnésie; Ger. Brausemagnesia, Magnesium-citrat in Körnern.)

Manufacture: Mix magnesium carbonate 10 Gm., citric acid 30, with distilled water 4 Cc., dry, powder, mix with sugar 8 Gm., sodium bicarbonate 34, citric acid 16, dampen with alcohol, rub through No. 6 tinned-iron sieve. It is a white, coarsely granular salt, odorless, mild acid, refreshing taste, deliquescent, soluble with effervescence in 2 parts water, insoluble in alcohol. *Impurities:* Tartrate, etc. Should be kept in well-closed vessels. Dose, ʒj–3 (4–12 Gm.).

PROPERTIES AND USES.—Same as liquor magnesii citratis, but more portable, yet not so pleasant.

Liquor Magnesii Citratis. Solution of Magnesium Citrate.—(Syn., Fr. Limonade au Citrate de Magnésie, Limonade purgative Citro-magnésienne; Ger. Magnesium-citrat Lösung, Flüssige Citronensaure Magnesia.)

Manufacture: Dissolve citric acid 30 Gm. in water 120 Cc., add magnesium carbonate 15 Gm., when dissolved filter, add syrup of citric acid 60 Cc., water 180, finally potassium bicarbonate 2.5 Gm., cork securely, in bottle. Dose, for purge, 1 bottle, as a laxative, ½ bottle.

PROPERTIES AND USES.—Cooling cathartic, operates mildly and is very pleasant.

Allied Product:

1. *Talcum, Talc, French Chalk,* $4MgO.5SiO_2.H_2O$.—Known also as steatite or soapstone; grayish-green, waxy lustre, sp. gr. 2.6; when purified, by being deprived of ferrous oxide, alumina and lime with hot dilute HCl, can be used as an aid in filtering, etc.

CALCIUM.

$Ca^{ii} = 40.$

The element calcium (L. *calx, calcis,* limestone, Gr. χάλιξ) is one of a group of three—calcium, barium, strontium, which form the alkaline earths. These metals, like the alkalies and magnesium, decompose water, liberating hydrogen; metallic calcium is light, yellow, ductile like gold, malleable; seldom met with except as the native salts, which are very abundant. The carbonate occurs in calc-spar, chalk, limestone, marble, shells of eggs, mollusca, etc.; acid carbonate in water; sulphate in alabaster, gypsum, bones; phosphate in apatite, animal bone, etc.; fluoride in fluorspar; chloride in water; silicate in rocks of various kinds.

Tests for Calcium Salts: 1. With soluble salts the alkaline carbonates give white precipitates, insoluble in excess. 2. With ammonium or potassium oxalate we get a white precipitate, insoluble in acetic but soluble in HCl. 3. With sulphuric acid or KOH or NaOH get white precipitates in strong calcium solutions, but not in diluted solutions. 4. Give reddish-yellow color to flame.

Calx. Lime, CaO.—(Syn., Burned Lime, Calcaria, Calx Viva, Calx Usta, Quicklime, Oxydum Calcicum, Calcium Oxide; Fr. Chaux (vive); Ger. Kalk, Gebrannter Kalk, Calcaria Usta, Aëtzkalk.)

Manufacture: Burn white marble, oyster shells, or the purest natural forms of calcium carbonate, in order to expel carbon dioxide. It is in hard, white or grayish-white masses, which, exposed, attract moisture and carbon dioxide, falling to white powder, odorless, taste sharp, caustic, soluble in 750 parts water, insoluble in alcohol; when we add water heat is produced, and thus it is gradually converted into calcium hydrate, or slaked lime, a white powder, or if 3–4 parts of water used get milk of lime. *Impurities:* Barium, aluminum, carbonate.

PREPARATION.—1. *Liquor Calcis.* Solution of Lime. (Syn., Solution of Calcium Hydrate, Lime Water, Aqua Calcis, Aqua Calcariæ (Ustæ), Calcaria Soluta, Oxydum Calcicum Aqua Solutum; Fr. Eau (Liqueur) de Chaux; Ger. Kalkwasser.)

Manufacture: Lime 12 Gm., distilled water 4,030 Cc. Slake the lime with water 70, then add water 360, agitate half-hour, throw this away, then add water 3,600, agitate and pour the milk of lime into dispensing bottles; shake occasionally to keep saturated. It is a clear saturated aqueous solution of $Ca(OH)_2$, the percentage varying slightly with the temperature, but usually being about 0.17 p. c. at 15° C. (59° F.) and less as the temperature rises; odorless, saline, caustic taste, absorbs carbon dioxide from air, hence a pellicle of $CaCO_3$ forms on the surface of the liquid, when heated becomes turbid from deposit of $Ca(OH)_2$, which redissolves upon cooling. It is usually made from ordinary limestone, which is not pure calcium carbonate, but contains some alkalies—it is to dissolve these latter that the first 360 parts of water are added and then rejected. *Assay:* 50 Cc. should require 20 Cc. $\frac{N}{10}$ oxalic acid V. S. for neutralization (corresponding to 0.14 (0.148) p. c. of $Ca(OH)_2$), phenolphtalein indicator. *Impurities:* Alkalies and their carbonates. Dose, ℥ss–4 (15–120 Cc.).

Prep.: 1. *Linimentum Calcis.* Lime Liniment. (Syn., Carron Oil; Fr. Liniment calcaire, Savon calcaire; Ger. Kalkliniment.)

Manufacture: Solution of lime, linseed oil each 1 vol., mix by agitation; use externally.

2. *Potassa cum Calce,* 50 p. c.; use externally.

3. *Syrupus Calcis.* Syrup of Lime. (Syn., Br. Liquor Calcis Saccharatus, Syrupus Calcariæ; Fr. Sirop de Chaux; Ger. Kalk-sirup.)

Manufacture: 6.5 p. c. Triturate lime 6.5 Gm. and sugar 40, add boiling water 50 Cc., boil five minutes, strain, add equal volume water, filter, evaporate to 70 Gm., cool, add water q. s. 100 Cc. Dose, ʒss–1 (2–4 Cc.).

PROPERTIES AND USES.—Lime—escharotic, depilatory, antacid, arrests putrefaction, hence added to stools of dysentery, cholera, typhoid fever, cesspools, sewers, ulcers, favus, psoriasis; Liquor—astringent, antacid; diarrhœa, diabetes, gravel, dyspepsia, scabies, tinea capitis, ulceration of bladder, urethra, mucous and purulent discharges, ascarides of the rectum, chronic bronchitis, vomiting, nausea, prevents milk curdling in stomach, aphthæ, thrush, typhoid fever, phthisis, rachitis, cutaneous eruptions, antidote to arsenous acid; Liniment—burns, scalded throat; Syrup—acute rheumatism, infantile diarrhœa, vomiting, urinary affections.

Calx Chlorata. Chlorinated Lime.—(Syn., Chloride of Lime, Calcium Hypochlorite, Bleaching Powder, Oxymuriate of Lime, Chloris Calcicus, Chloruretum Calcis, Calcis Chloridum, Calcii Hypochloris, Calx Chlorinata; Fr. Chlorure de Chaux, Poudre de Tennant ou de Knox; Ger. Calcaria Chlorata, Chlorkalk, Bleichkalk.)

Manufacture: Pass chlorine gas over powdered slaked lime, spread upon shelves—$2Ca(OH)_2 + 4Cl = Ca(ClO)_2,CaCl_2 + 2H_2O$. It is a white or grayish-white granular powder, having the odor of hypochlorous acid (chlorine), repulsive, saline taste, becoming moist and decomposed by exposure; contains about 35 p. c. available chlorine, only partly soluble in water or alcohol. *Assay:* 0.35 Gm. + 50 Cc. water + 0.8 Gm. KI + 5 Cc. dil. HCl; this reddish-brown liquid mixed with a few drops starch T. S. should require 35 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. for decoloration (each Cc. of V. S. corresponding to 1 p. c. available chlorine). Should be kept dry, cool, in well-closed vessels. Dose, gr. 1–5 (.06–.3 Gm.) in solution; mouth wash (1 p. c.); lotion (3–5 p. c.); ointment (10 p. c.).

PREPARATION.—1. *Liquor Sodæ Chloratæ.* Solution of Chlorinated Soda. (Syn., Labarraque's Solution, Liquor Natri (Chlorati) Hypochlorosi; Fr. Chlorure de Soude liquide, Liqueur de Labarraque; Ger. Bleichflüssigkeit, Chlornatronlösung.)

Manufacture: Sodium carbonate 150 Gm., chlorinated lime 75, water q. s. 1,000. The chlorinated lime is triturated with about half of the water in two equal portions, filtered, the sodium carbonate is dissolved in the remaining water, which is to be hot, then filtered and added to former liquid (here calcium carbonate is precipitated while chlorinated soda and sodium chloride remain in solution), filter—$2Na_2CO_3 + Ca(ClO)_2,CaCl_2 = 2(NaClO,NaCl) + 2CaCO_3$. Hot water is used to make the precipitate, $CaCO_3$, compact; must not apply heat for this purpose, if so the solution is decomposed into chloride and chlorate, while oxygen is evolved. It is a clear, pale-greenish liquid, chlorine odor, disagreeable alkaline taste, consisting of several chlorine compounds of sodium which contain about 2.6 p. c. by weight of available chlorine, sp. gr. 1.052, add HCl to it we get effervescence of Cl and CO_2. Should be kept in the dark, in well-stoppered bottles. Dose, ♏xxx–40 (2–2.6 Cc.), in water or some mild liquid; as a gargle or injection should be diluted 8–10 times with water.

PROPERTIES AND USES.—Desiccant, disinfectant (one of the very best), deodorizer; ulcers, chilblains, burns, skin troubles, itch, putrid sore throat, ulcerated gums, dysentery, typhus fever, scrofulous enlargements, ophthalmia, aphthæ, cancers, foul breath, mercurial salivation, antidote to hydrocyanic acid and hydrosulphuric acid. Liquor—

stimulant, antiseptic, resolvent, typhus fever, scarlatina, dysentery, glandular enlargements, dyspepsia, syphilis, scrofula, carbuncles, ozæna, psoriasis, tinea capitis, scabies, herpetic affections, small-pox, sore nipples, sick chambers, etc.

Calx Sulphurata. Sulphurated Lime (Crude Calcium Sulphide).—(Syn., Hepar Calcis, Hepar Sulphuris Calcareum; Fr. Sulfure de Chaux; Ger. Kalkschwefelleber, Calcaria Sulfurata.)

Manufacture: Dried calcium sulphate 70 Gm., charcoal 10, starch 2; mix and heat to redness, until black color lost—$CaSO_4 + C_3 = CaS + 2CO + CO_2$. It is a pale-gray powder, being a mixture of about 60 p. c. calcium monosulphide (CaS) with calcium sulphate ($CaSO_4$) and carbon in varying proportions; odor of H_2S, nauseous, alkaline taste, decomposed by exposure, slightly soluble in water, insoluble in alcohol, decomposed by diluted acetic acid into calcium acetate, hydrogen sulphide and calcium sulphate. *Assay:* 1 Gm. + 2.08 Gm. cupric sulphate, boiled in 50 Cc. water fifteen minutes, cool, filter, and to this 1 drop potassium ferrocyanide T. S. should give no color (presence of 60 p. c. pure CaS). Should be kept in glass-stoppered bottles. Dose, gr. $\frac{1}{10}$–$\frac{1}{2}$ (.006–.03 Gm.).

PROPERTIES AND USES.—Depilatory, itch, acne, furuncular eruptions, buboes, leucorrhœa, rhinitis, diphtheria, rheumatism.

Calcii Chloridum. Calcium Chloride, $CaCl_2$.—(Syn., Chloridum Calcicum, Calcium Chloratum, Calcaria (Muriatica) Hydrochlorata; Fr. Chlorure de Calcium, Hydrochlorate de Chaux; Ger. Chlorcalcium, Salzsaures Kalk.)

Manufacture: Neutralize hydrochloric acid with calcium carbonate, evaporate, fuse—$CaCO_3 + 2HCl = CaCl_2 + H_2O + CO_2$. This has to be rendered anhydrous by fusion at lowest possible temperature (200° C.; 392° F.), and occurs in crude state as a by-product in several chemical processes. It is in white, slightly translucent, hard fragments, odorless, sharp, saline taste, very deliquescent, soluble in 1.5 parts water, 8 alcohol. *Impurities:* Arsenic, lead, magnesia, alkalies, iron, barium, aluminum, sulphate. Should be kept in well-stoppered bottles. Dose, gr. 10–20 (.6–1.3 Gm.), in water or milk.

PROPERTIES AND USES.—Irritant—excessive doses occasion gastro-intestinal inflammation; Resolvent—glandular enlargements, scrofulous swellings, skin diseases, lupus, uterine and ovarian tumors, fibroids.

Calcii Carbonas Præcipitatus. Precipitated Calcium Carbonate, $CaCO_3$.—(Syn., Creta Præcipitata, Carbonas Calcicus Præcipitatus; Fr. Carbonate de Chaux précipité, Craie précipitée; Ger. Calcaria Carbonica Præcipitata, Präcipitirter Kohlensaurer Kalk.)

Manufacture: By double decomposition between solution of calcium chloride and sodium carbonate, filter and dry the precipitate—$CaCl_2 + Na_2CO_3 = CaCO_3 + 2NaCl$.

It is a fine white powder, odorless, tasteless, permanent, nearly insoluble in water, alcohol, soluble in diluted acetic, hydrochloric, or nitric acid with effervescence. *Impurities:* Arsenic, lead, iron, aluminum, magnesium, alkalies, sulphate, phosphate, chloride.

Creta Præparata. Prepared Chalk, $CaCO_3$.—(Syn., Creta Lævigata; Fr. Craie préparée, Craie lavée; Ger. Präparirte Kreide, Schlämmkreide.)

Manufacture: Chalk is a very abundant mineral, occurring largely on the English Channel coast. It consists of infinitesimal shells of foraminifera, composed mostly of $CaCO_3$, but having more or less silica, aluminum, iron, magnesia, and organic matter. Our official prepared chalk is, then, this native friable $CaCO_3$, freed from nearly all of these impurities by elutriation, which consists in washing finely powdered chalk or whiting (the latter being the deposit from the first washings of water) with water, decanting and allowing the suspended powder to subside; this then can be formed into cones or sticks, either of which can be left white, or by adding various coloring substances formed into crayon pencils, etc. Prepared chalk is a white, amorphous powder, often moulded into conical drops, odorless, tasteless, permanent, nearly insoluble in water, alcohol, soluble in diluted acetic, hydrochloric, or acetic acid with effervescence, if heated loses CO_2, yielding CaO. *Impurities:* Iron, magnesium, barium sulphate.

PREPARATIONS.—1. *Trochisci Cretæ.* Troches of Chalk. (Syn., Fr. Tablettes (Pastilles) de Craie (préparée) lavée; Ger. Kreidepastillen.)

Manufacture: Rub prepared chalk 25 Gm., acacia 7, sugar 40, with spirit of nutmeg 3 Cc. until mixed, form mass with water q. s. 100 troches. Dose, *ad libitum.*

2. *Pulvis Cretæ Compositus.* Compound Chalk Powder. (Syn., Fr. Poudre de Craie composée; Ger. Kreidepulver mit Gummi.)

Manufacture: 30 p. c. Mix thoroughly prepared chalk 30 Gm., acacia 20, sugar 50. Dose, gr. 5–60 (.3–4 Gm.).

Prep.: 1. *Mistura Cretæ.* Chalk Mixture. (Syn., Fr. Mixture avec la Craie; Ger. Kreidemixtur.)

Manufacture: Rub thoroughly in a mortar compound chalk powder 20 Gm. with cinnamon water 40 Cc., water q. s. 100 Cc. Dose, ʒij–4 (8–15 Cc.).

3. *Hydrargyrum cum Creta,* 57 p. c. Dose, gr. 2–10 (.13–.6 Gm.).

PROPERTIES AND USES.—Mainly in tooth powders, etc., the precipitated is considered best for such preparations, as it is finer and contains no grit; the prepared is better in chalk mixtures, face and toilet powders, from its more adhesive properties; the troches are used as a mild astringent, antacid in diarrhœa, being well adapted for children; the mistura for diarrhœa, loose bowels of infants, etc.

Incompatibles: Acids and sulphates.

Allied Salt:

1. *Calcis Carbonas. Carbonate of Lime.*—Formerly official under two forms, viz.:

1. *Calcis Carbonas Durus* (hard), Marmor, Marble.—Official, 1830–1880. Also called "native white granular carbonate of lime."
2. *Calcis Carbonas Mollis* (soft), Creta, Chalk.—Official, 1830–1880. Also called "native friable carbonate of lime."

Calcii Bromidum. Calcium Bromide, $CaBr_2$.—(Syn., Fr. Bromure de (Chaux) Calcium; Ger. Bromcalcium, Calcium (bromid) Bromatum.)

Manufacture: Dissolve pure calcium carbonate in hydrobromic acid, evaporate the solution—$CaCO_3 + 2HBr = CaBr_2 + H_2O + CO_2$, or by boiling milk of lime with ammonium bromide. It is a white granular salt, being odorless, and having a sharp, saline taste, very deliquescent, soluble in 0.7 part water, 1 alcohol, partially decomposed by heat, with loss of bromine. *Assay:* 0.25 Gm. + 10 Cc. water + 2 drops potassium chromate T. S. should require 25 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce a permanent red (corresponding to 99.7 p. c. pure salt, a greater amount indicating presence of chloride and other impurities). *Impurities:* Iron, aluminum, magnesium, alkalies, arsenic, lead, bromate, iodide, sulphate, chloride, nitrate, nitrite. Should be kept in well-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.), in water.

PROPERTIES AND USES.—As a substitute for potassium bromide, hypnotic, sedative, insomnia, hysteria, epilepsy.

Calcii Hypophosphis. Calcium Hypophosphite, $Ca(PH_2O_2)_2$.—(Syn., Hypophosphis Calcicus, Hypophosphite of Lime; Fr. Hypophosphite de Chaux; Ger. Calcium Hypophosphorosum, Calcaria Hypophosphorosa, Unterphosphorigsaurer Kalk.)

Manufacture: Boil phosphorus in milk of lime, when dissolved pass CO_2 into the solution to precipitate excess of lime, filter, crystallize—$8P + 3Ca(OH)_2 + 6H_2O = 3Ca(PH_2O_2)_2 + 2PH_3$ (inflammable phosphine). It is in colorless, transparent, monoclinic prisms, or small lustrous scales, or white crystalline powder, odorless, nauseous, bitter taste, permanent, soluble in 6.8 parts water, insoluble in alcohol. When heated decrepitates, decomposing into inflammable gases (hydrogen, phosphine or hydrogen phosphide), and calcium pyro- and meta-phosphate, with some red phosphorus. *Assay:* 0.1 Gm. + 10 Cc. water + 10 Cc. H_2SO_4 + 50 Cc. $\frac{N}{10}$ potassium permanganate V. S. + boiling fifteen minutes should require 3 Cc. $\frac{N}{10}$ oxalic acid V. S. to discharge red color (corresponding to 99.68 p. c. pure salt). *Impurities:* Magnesium, arsenic, sulphate, phosphate. Dose, gr. 5–30 (.3–2 Gm.).

PREPARATION.—1. *Syrupus Hypophosphitum,* 4.5 p. c. Dose, ʒj–2 (4–8 Cc.).

PROPERTIES AND USES.—Stimulant to nervous system, chronic phthisis, scrofulous diseases, caries, chlorosis, menorrhagia, fractures, rickets, Pott's disease. In pharmacy this salt is the base of all the other hypophosphites, along with which others this is often prescribed.

Calcii Phosphas Præcipitatus. Precipitated Calcium Phosphate, $Ca_3(PO_4)_2$.—(Syn., Phosphas Calcicus Præcipitatus, Calcaria

Phosphorica; Fr. Phosphate de Chaux hydraté; Ger. Calcium Phosphoricum, Calcium Phosphat, Phosphorsaure Kalkerde.)

Manufacture: Dissolve bone-ash (bone calcined to whiteness and in fine powder) in HCl, thus forming calcium phosphate and calcium chloride in solution, precipitate solution with ammonia water; this gives ammonium chloride and precipitates tri-calcium phosphate, containing traces of calcium fluoride and magnesium phosphate—(1) $Ca_3(PO_4)_2 + 4HCl = CaH_4(PO_4)_2 + 2CaCl_2$. (2) $CaH_4(PO_4)_2 + 2CaCl_2 + 4NH_4OH = Ca_3(PO_4)_2 + 4NH_4Cl + 4H_2O$. A purer salt is made thus—$2Na_2HPO_4 + 3CaCl_2 + 2NH_4OH = Ca_3(PO_4)_2 + 4NaCl + 2NH_4Cl + 2H_2O$. It is a light, white amorphous powder, odorless, tasteless, permanent, insoluble in water or alcohol, soluble in HCl or HNO_3. *Impurities:* Arsenic, lead, iron, magnesium, barium, sulphate, chloride, carbonate, acid calcium phosphate (when present, after ignition, and being moistened with silver nitrate T. S. remains white, whereas pure salt with $AgNO_3$ before or after ignition turns yellow. Dose, gr. 5–30 (.3–2 Gm.).

PREPARATION.—1. *Syrupus Calcii Lactophosphatis.* Syrup of Calcium Lactophosphate. (Syn., Fr. Sirop de Lactophosphate (Phospholactate) de Chaux; Ger. Calcium Phospholactatsirup.)

Manufacture: Dissolve precipitated calcium carbonate 2.5 Gm. in lactic acid 6 Cc. + water 10, add phosphoric acid 3.6, when precipitate dissolved add water 22.5, filter, add orange flower water 2.5, sugar 70 Gm., when dissolved by agitation add water q. s. 100 Cc. Dose, ʒij–4 (8–15 Cc.).

PROPERTIES AND USES.—In defective nutrition, rickets (mollities ossium), scrofulous affections, chronic phthisis, fractures, night-sweats.

In pharmacy, owing to its insolubility in water, is used instead of magnesium carbonate, for making medicated waters and clarifying various mixtures.

Calcii Sulphas Exsiccatus. Dried Calcium Sulphate (Dried Gypsum).—(Syn., Plaster of Paris; Br. Calcii Sulphas; Fr. Plâtre; Ger. Gebrannter Gyps, Calcium Sulfuricum Ustum.)

Manufacture: The purer varieties of native gypsum ($CaSO_4 + 2H_2O$) are carefully heated to 105° C. (212° F.) until three-fourths of the water has been expelled—$CaSO_4 + 2H_2O$ + heat $= CaSO_4$. As such with the water of crystallization driven off it is known as *plaster of Paris.* It is a fine white powder containing about 95 p. c. by weight of $CaSO_4$ and 5 p. c. water, odorless, tasteless. Exposed to moist air, it attracts water, becomes granular, losing the property of hardening with water, hence should be kept in well-closed vessels protected from moisture; when mixed with half its weight of water forms a smooth paste which rapidly hardens. *Impurities:* Carbonate, water.

PROPERTIES AND USES.—Mainly by surgeons for mechanical purposes, not internally. In making casts, supports, etc., for fractures, Pott's disease (spinal), lateral curvature, deformities of ankle- and knee-joints, in certain amputations to fix the bandages.

.BARIUM.

$Ba^{ii} = 136.9$.

The element barium (L. *bar(ytes)+ium*, fr. Gr. *βαρύς*, heavy, owing to high sp. gr. of heavy spar) and its compounds are not much used in medicine; it is rarely found in nature, and occurs then chiefly as sulphate (barite or heavy spar, $BaSO_4$), also as carbonate (witherite, $BaCO_3$). The metal fuses with difficulty, is of a silvery-gray color, decomposes water, oxidizes rapidly, sp. gr. 3.6. Salts are poisonous and their antidotes are sodium and magnesium sulphates. The sulphate is used to adulterate white lead; the nitrate in preparing green fire.

Tests for Barium Salts: 1. With H_2SO_4 or a soluble sulphate get white precipitate of barium sulphate, insoluble in all acids. 2. With alkaline carbonate get white precipitate, insoluble in excess. 3. With $K_2Cr_2O_7$ get pale-yellow precipitate of $BaCrO_4$. 4. Gives yellowish-green color to flame.

Barii Dioxidum. Barium Dioxide, BaO_2.—(Syn., Barium Peroxide; Fr. Peroxyde de Baryum; Ger. Barium Hyperoxyd.)

Manufacture: Pass oxygen or air over barium oxide or hydroxide heated to redness—$BaO+O+$heat (450° C.; 850° F.)$=BaO_2$. It is the commercial anhydrous barium dioxide, being a heavy grayish, or yellowish-white amorphous coarse powder, odorless, tasteless, almost insoluble in water, readily forms salts with various acids. Slowly absorbs H_2O and CO_2, thereby becoming decomposed, hence should be kept in well-closed vessels. *Assay:* 2.11 Gm.+25 Cc. ice water+7.5 Cc. phosphoric acid; of this solution 5 Cc. (corresponding to 0.422 Gm. of dioxide), should require 40 Cc. $\frac{N}{10}$ potassium permanganate V. S. to produce permanent pink, corresponding to 80 p. c. pure salt (each Cc. of V. S. indicating 2 p. c. of BaO_2).

PREPARATION.—1. *Aqua Hydrogenii Dioxidi.* Dose, ʒj–3 (4–12 Cc.); mostly used externally.

PROPERTIES AND USES.—Only used in making the above official water.

Allied Salt:

1. *Barii Sulphas. Barium Sulphate,* $BaSO_4$.—Official, 1830–1840. This is a native mineral (heavy spar) from which the other barium compounds are prepared. It is heavy, lamellar, brittle, sp. gr. 4.6, white or flesh-red. When heated decrepitates, melting into a white enamel (sulphide), which becomes a powder after some hours, insoluble in most solvents, therefore non-poisonous; soluble in excess of dil. hydrochloric acid. The artificial sulphate, made by precipitation from sulphide solution with dil. H_2SO_4, is known as *permanent white* or *blanc fix*, used for glazing cards, in water colors, and by painters instead of white lead.

Barii Chloridum. Barium Chloride, $BaCl_2,2H_2O$.—Official, 1870–1880. Obtained by dissolving barium carbonate in dil. HCl, evaporating, crystallizing—$BaCO_3 + 2HCl = BaCl_2 + H_2O + CO_2$; or (1) $BaSO_4 + C_2$ + white heat $= BaS + 2CO_2$, (2) $BaS + 2HCl = BaCl_2 + H_2S$. While the first method, from the native carbonate, is the better, that salt is, however, so scarce that the second formula is generally followed. It is in colorless, translucent rhomboidal tables or lamellæ, permanent, soluble in dilute alcohol or water. *Impurities:* Carbonate, sulphate, lead, metals, alkalies, calcium, strontium chloride.

PREPARATION.—1. *Liquor Barii Chloridi.* (12.2 Gm. + water q. s. 100 Cc.)

Allied Salt:

1. *Barii Carbonas. Barium Carbonate,* $BaCO_3$.—Official, 1870–1880.

This is native *witherite,* found in lead mines in England, Scotland, Sweden. May be obtained artificially by precipitating soluble barium salt with an alkali carbonate, or can fuse barium sulphate 10 parts, carbon 2, potassa 5; wash the mass with water, thus leaving behind the carbonate—$BaSO_4 + C_2 + 2KOH = BaCO_3 + K_2S + CO_2 + H_2O$. It is in grayish fibrous masses or rhombic crystals, sp. gr. 4.5. If made artificially it is a soft, white, amorphous, or crystalline tasteless powder. *Impurities:* Sulphate, lead, metals, alkalies, calcium.

Other barium salts can be readily made by acting upon this salt with the respective acids, thus, nitrate $= BaCO_3 + 2HNO_3 = Ba(NO_3)_2 + H_2O + CO_2$, hydrate $= BaCO_3 + 2KOH = Ba(OH)_2 + K_2CO_3$, also bromide, iodide, etc. The test solutions of the chloride, hydrate, and nitrate are all officially used in assaying official salts, acids, etc.

Barium compounds, although poisonous, are sometimes used in medicine as alterative, diuretic, cardiac tonic, cutaneous affections, scrofula.

Poisoning: Have salivation, thirst, vomiting, purging, difficult breathing, spine paralysis. Give emetics, magnesium or sodium sulphate, albuminous drinks, diffusible stimulants.

STRONTIUM.

$Sr^{ii} = 87.4.$

The element strontium (L. fr. *strontian,* in Argyleshire, Scotland, where first found as *strontianite,* $SrCO_3$) in the form of its compounds was not until recently used to any extent in medicine. It occurs natively as sulphate (*celestite,* $SrSO_4$) and carbonate. The metal itself is yellow, malleable, harder than lead, sp. gr. 2.5, oxidizes quickly when exposed, hence has to be kept under naphtha, like the alkali metals. The salts can be produced similar to those of barium, thus: Heat strontium sulphate with carbon, which gives strontium sulphide; this sulphide dissolved in HCl yields the chloride, which by double decomposition with Na_2CO_3 gives pure strontium carbonate, from which all official salts are made.

Tests for Strontium Salts: 1. With alkaline carbonates, oxalates, or phosphates get white precipitate. 2. With calcium sulphate get white precipitate of $SrSO_4$. 3. With H_2SO_4 or a soluble sulphate get white precipitate. 4. Add potassium chromate and get yellow precipitate, $SrCrO_4$, soluble in acids; here $K_2Cr_2O_7$ gives no precipitate. 5. Gives a beautiful red color to flame.

Strontii Bromidum. Strontium Bromide, $SrBr_2 + 6H_2O$.—(Syn., Fr. Bromure de Strontium; Ger. Strontiumbromid.)

Manufacture: Dissolve strontium carbonate in hydrobromic acid until neutralized, evaporate, crystallize—$SrCO_3 + 2HBr = SrBr_2 + H_2O + CO_2$. It is in colorless, transparent, hexagonal crystals, odorless, bitter, saline taste, very deliquescent, soluble in 1.05 parts water, also in alcohol, from which it is precipitated by ether. *Assay:* 0.3 Gm. previously dried, + 10 Cc. water + 3 drops potassium dichromate T. S. should require 24.6 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce permanent red color (corresponding to 98 p. c. pure salt). *Impurities:* Barium, arsenic, lead, copper, iron, aluminum, iodine. Should be kept in glass-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.).

PROPERTIES AND USES.—Similar to potassium bromide—epilepsy, gastric disorders, albuminuria.

Strontii Iodidum. Strontium Iodide, $SrI_2 + 6H_2O$.—(Syn., Fr. Iodure de Strontium; Ger. Strontiumjodid.)

Manufacture: Dissolve strontium carbonate in hydriodic acid, until neutralized, evaporate, crystallize—$SrCO_3 + 2HI = SrI_2 + H_2O + CO_2$. It is in colorless, transparent, hexagonal plates, odorless, bitter, saline taste, deliquescent, turning yellow by exposure, soluble in 0.6 part water, also in alcohol. When heated loses water (24.05 p. c.), if to red heat loses iodine, leaving strontium oxide. *Assay:* 0.3 Gm. previously dried, + 10 Cc. water + 3 drops potassium dichromate T. S. should require 18 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce a permanent red color (corresponding to 98 p. c. pure salt). *Impurities:* Barium, arsenic, copper, lead, iron, aluminum. Should be kept in dark amber glass-stoppered bottles. Dose, gr. 10–30 (.6–2 Gm.).

PROPERTIES AND USES.—Alterative. Does not irritate intestinal tract nor depress nutrition; may be substituted for potassium iodide.

Strontii Lactas. Strontium Lactate, $Sr(C_3H_5O_3)_2 + 3H_2O$.—(Syn., Fr. Lactate de Strontium; Ger. Milchsaurer Strontian, Strontium-lactat.)

Manufacture: Dissolve strontium carbonate in lactic acid until neutralized, evaporate, crystallize—$SrCO_3 + 2HC_3H_5O_3 = Sr(C_3H_5O_3)_2 + H_2O + CO_2$. It is a white granular powder, or in crystalline nodules, odorless, bitter, saline taste, permanent; soluble in 4 parts water, also in alcohol. By heat decomposes into carbonate, which effervesces with HCl. *Assay:* 1.33 Gm. dried and burnt to carbonate, + 10 Cc. water should require 9.9 Cc. normal H_2SO_4 for neutralization (corresponding to 98.6 p. c. pure salt), methyl-orange indicator. *Impurities:* Barium, carbonate, oxalate, chloride, butyrate, propionate, arsenic, lead, iron, aluminum. Dose, gr. 10–30 (.6–2 Gm.), ter die.

PROPERTIES AND USES.—Diuretic; nephritis, albuminuria, rheumatism, gout, causes disappearance of the urates.

Incompatibles: Carbonate and sulphate solutions, potassium chromate. Some of the unofficial salts, such as nitrate, etc., are used for red fire.

ALUMINUM.

$Al^{iii} = 27.4.$

The metal aluminum (L. *alumen alumin(is)* + *um*, *alum*, fr. *alo*, to nourish, as confounded with iron sulphate) is the typical representative of the earths and the only one having any medicinal use, the other members being only of scientific interest. It occurs largely in combination with silicic acid in silicated rocks, clays, forming the greater bulk of our earth—basalt, feldspar, granite, hornblend, mica, slate. Clay results from the decomposition of these. The valuable minerals corundum, emery, ruby and sapphire are crystals of aluminum oxide colored with other substances. The metal is obtained by decomposing Al_2Cl_6 with metallic sodium—$Al_2Cl_6 + 6Na = 2Al + 6NaCl$. It is a silvery-white metal, sp. gr. 2.6, capable of taking a high polish; very light, owing to which it is becoming very popular for many purposes.

Tests for Aluminum Salts.—1. Potassium or sodium hydroxide gives white gelatinous precipitate soluble in excess. 2. Ammonium hydroxide gives the same precipitate, but insoluble in excess. 3. Alkaline carbonates precipitate also the white hydroxide with liberation of CO_2. 4. Ammonium sulphide precipitates the same, liberating H_2S. 5. Sodium phosphate precipitates aluminum phosphate, soluble in acids.

Alumen. Alum, $Al_2K_2(SO_4)_4 + 24H_2O$.—(Syn., Potassium Alum, Aluminum and Potassium Sulphate, Sulphas Aluminico-potassicus; Fr. Alun, Sulfate d'Alumine et de Potasse; Ger. Alaun, Kali-Alaun.)

Manufacture: 1. Treat aluminum silicate (alum-clay) with H_2SO_4, in order to form aluminum sulphate, to this, in solution, add potassium sulphate, which upon evaporation yields the double salt in crystals.

2. Roast alum-slate or shale (aluminum silicate + iron sulphide) in heaps, the sulphur of the pyrites is oxidized into H_2SO_4, also aluminum and iron sulphates are formed, which by lixiviation are dissolved out by water. This solution is concentrated, and while hot mixed with KCl, which reacts upon the ferric sulphate, giving K_2SO_4 and Fe_2Cl_6, this latter remains in solution while alum separates upon cooling as a crystalline powder. It occurs in large colorless octahedral crystals, or cubes, or crystalline fragments, odorless, sweetish, astringent taste, soluble in 9 parts water, also in warm glycerin, insoluble in alcohol. On exposure crystals may absorb ammonia and become covered with a white coating. *Impurities:* Ferrous sulphate, copper, lead, zinc, ammonium alum. Dose, gr. 5–40 (.3–2.6 Gm.) with sugar, syrup, etc.; emetic, ʒj–2 (4–8 Gm.).

PREPARATION.—1. *Alumen Exsiccatum.* Dried Alum, $Al_2K_2(SO_4)_4$. —(Syn., Alumen Ustum, Burnt Alum; Fr. Alun calciné—desséché—brulé; Ger. Gebrannter Kali-Alaun.)

Manufacture: Heat alum 100 Gm. until it liquefies and then moderately until it weighs 55 Gm. It is a white, granular powder, odorless, sweet, astringent taste, absorbs moisture from air, soluble in 20 parts water.

PROPERTIES AND USES.—Astringent, irritant, emetic, purgative, hemorrhage, serous diarrhœa, colliquative sweats, menorrhagia, hæmaturia, gastric, intestinal catarrh, dysentery, diabetes, bronchitis, whooping-cough, lead colic, croup, narcotic poisoning, intermittent fever, ophthalmia, ecchymoses, sore throat, aphonia, ingrowing toe-nails, chilblains, ulcers, burns, relaxed gums, uvula, pharynx, vagina, anus, gonorrhœa, gleet, leucorrhœa, toothache. Dried Alum—astringent, stimulant, escharotic, more powerful than the preceding, fungous granulations, ulcers, insufflation. Both are applied locally in powder, lotion, injection, sprays, gargles (3–5 p. c.).

Incompatibles: Alkalies, lime, lead, mercury, iron salts, tartrates, tannin.

Allied Salt:

1. *Alumini et Ammonii Sulphas. Sulphate of Aluminum and Ammonia. Ammonia Alum.*—Official, 1860–1870.

Here ammonium sulphate instead of potassium sulphate, as in the present official alum, is added to the solution of aluminum sulphate. This alum is much used now, owing to the cheapness of the ammonium salt used in its manufacture, while in action and appearance it is identical with our official—only recognized as different by chemical tests.

Alumini Hydras. Aluminum Hydrate, $Al_2(OH)_6$.—(Syn., Aluminum Hydroxide, Hydrated Alumina; Fr. Hydrate d'Alumine; Ger. Thonerdehydrat, Argilla (Pura) Hydrata.)

Manufacture: Alum 10 Gm., sodium carbonate 10, distilled water q. s. Each salt is dissolved separately in distilled water 100 Cc., heated, mixed (add alum to sodium), precipitate washed with hot water, dried, powdered—$K_2Al_2(SO_4)_4 + 3Na_2CO_3 + 3H_2O = Al_2(OH)_6 + K_2SO_4 + 3Na_2SO_4 + 3CO_2$. It is a white, light, amorphous powder, odorless, tasteless, permanent, insoluble in water, alcohol. *Impurities:* Sulphate, alkali salts, lead, iron, zinc. Dose, gr. 3–6 (.2–.4 Gm.).

PROPERTIES AND USES.—Resembles bismuth oxide and magnesia. Feebly astringent, desiccant powder, antacid. Used externally on skin in inflammations, dyspepsia, diarrhœa, intertrigo, superficial burns.

Alumini Sulphas. Aluminum Sulphate, $Al_2(SO_4)_3 + 16H_2O$.—(Syn., Fr. Sulfate d'Alumine; Ger. Aluminium Sulfuricum, Aluminium Sulfat, Schwefelsaure Thonerde.)

Manufacture: Dissolve freshly precipitated alumini hydras in diluted H_2SO_4, filter, evaporate, granulate. It is a white, crystalline powder, odorless, sweetish, astringent taste, permanent, soluble in 1.2

parts water, insoluble in alcohol. Heated to 200° C. (392° F.) loses its water of crystallization (45.7 p. c. of its weight). *Impurities:* Iron, copper, lead, zinc, ammonia, free acids.

PROPERTIES AND USES.—Disinfectant, deodorant, antiseptic, leucorrhœa, chronic dysentery, ulcers, cancers, nævi, polypi, fetid discharges, enlarged tonsils, nasal catarrh, diseases of the os uteri, scrofulous sores. Injection (50 p. c.) is of most service in preserving subjects for dissection—not so effective as zinc chloride, nor is it used internally.

Allied Product:

1. *Kaolin, Porcelain Clay, Fuller's Earth.*—This is hydrated aluminum silicate, $Al_2(SiO_3)_2 + Al_2O(OH)_4$; white powdery, unctuous when moist, used to clarify and decolorize vegetable and animal oils, dusting powder upon irritated surfaces, excipient for $AgNO_3$,$KMnO_4$, etc.

CERIUM.

$Ce^{iv} = 141.$

The element cerium (named by Berzelius, 1803, after asteroid *Ceres*, then just discovered, 1801) occurs sparingly in nature, chiefly in cerite, also in gadolinite, allanite, and orthite. Monzanite sand, N. Ca., contains cerite, also silicates or oxides or phosphates of other earthy metals, as zirconium, erbium, thorium. The oxide of thorium gives a bright-white light at comparatively low temperature, on which account it is employed in the mantle of the *Welsbach* incandescent burner. Cerium resembles aluminum in chemical behavior, but its salts act medicinally like those of bismuth and silver. The metal itself is chocolate-brown, burning more easily than magnesium, oxidizing readily in moist atmosphere, and forms two oxides—*cerous*, Ce_2O_3, and *ceric*, CeO_2. We have only one official salt.

Tests for Cerium Salts: 1. If to a colorless cerous salt sodium hypochlorite be added we get a red precipitate, which is soluble in warm HCl, with evolution of chlorine. 2. Any residue, after heating a cerium salt, dissolved in H_2SO_4 and strychnine crystal added, gives a deep-blue, changing to purple, then red.

Cerii Oxalas. Cerium Oxalate, $Ce_2(C_2O_4)_3 + 9H_2O$.—(Syn., Cerous Oxalate, Oxalas Cericus; Fr. Oxalate de Cerium; Ger. Cerium Oxalicum, Oxalsaures Ceroxydul, Ceroxalat.)

Manufacture: The native silicates containing metal are decomposed by heating with H_2SO_4; then dissolve in dil. HNO_3 and pass H_2S into the solution to remove copper and some allied metals. To the filtered solution HCl is added to keep the calcium salt in solution, and finally oxalic acid, which precipitates the cerite metals as oxalates. This precipitate of oxalates is mixed with magnesium carbonate, then calcined to decompose the oxalates and residue dissolved in HNO_3, this solution is thrown into water containing ½ p. c. H_2SO_4. Lanthanum, didymium and magnesium remain in solution, ceric sulphate being precipitated, the latter is dissolved in H_2SO_4, reduced to cerous sulphate by sodium thiosulphate, and the oxalate precipitated by adding oxalic acid. It is a white, granular powder, odorless, tasteless, permanent, insoluble in water or alcohol or ether, soluble in dil. H_2SO_4 or HNO_3. *Impurities:* Aluminum, carbonate, zinc, arsenic, didymium. Dose, gr. 2–10 (.13–.6 Gm.), ter die, in powder, pill, or water.

Properties and Uses.—Nervous and gastric sedative, similar to bismuth subnitrate; nausea, vomiting of pregnancy, sea-sickness, asthma, uterine disorders, hysteria, dyspepsia, pyrosis, cough of phthisis, bronchitis, chorea.

FERRUM. IRON.

$Fe^{ii} = 55.88.$ $Fe_2^{vi} = 111.76.$

The element iron (AS. *iren*, Goth. *iarn*, metal; L. *ferrum*) is the most useful and abundant of the heavier metals, being present in nearly all rocks, soils, animal and plant ashes, but seldom in the pure state. It occurs as sulphide—iron pyrites, FeS_2; as oxide—magnetic iron ore, FeO, Fe_2O_3; red hematite, Fe_2O_3; as carbonate—spathic iron ore, $FeCO_3$, and also combined with mineral acids. From any of these ores the metal can be obtained by reducing with carbon, which consists of heating in a blast furnace iron ore, coke or coal and some flux as limestone or clay. This latter forms a more fusible aluminum and calcium silicate or slag. (1) $Fe_2O_3 + 3C = 2Fe + 3CO$. (2) $FeCO_3 + C = Fe + CO_2 + CO$. (3) $FeS_2 + O_4 = Fe + 2SO_2$. As such it is known as cast or pig iron, and is not pure from its containing traces of silicon, sulphur, phosphorus, and carbon, 2–5 p. c. By puddling or refining the carbon combines with a blast of oxygen and is blown out, leaving wrought or bar iron, having still present carbon 0.03–0.3 p. c. Steel is an intermediate product of these two, containing carbon 0.5–2 p. c.

Iron is hard, malleable, ductile, tenacious, grayish, fibrous texture; taste slightly styptic, odor slight, magnetic, sp. gr. 7.7, least fusible of all useful metals excepting platinum, readily oxidizes in moisture and forms two kinds of salts, *ferrous* (lower) and *ferric* (higher). The metal itself and many important salts are official.

Tests for Iron Salts: 1. Ferrous salt with potassium ferrocyanide gives a nearly white precipitate, turning blue on exposure to air; with ferric salt have deep-blue color at once—Prussian blue. 2. Ferrous salt with potassium ferricyanide gives at once deep-blue color—Turnbull's blue; with ferric salts have greenish-olive color. 3. Ferrous salt with tannin has no effect; with ferric salt have greenish-black precipitate—ferric tannate (ink). 4. Ammonium sulphide gives black precipitate with both kinds of salts. 5. Ferrous salts with ammonia water gives whitish precipitate, turning green, then black, brown; with ferric salts have precipitate of brown ferric hydrate.

Ferrum. Iron.—(Syn., Iron wire, Mars; Fr. Fer, Fil de Fer; Ger. Eisen, Eisendraht.) Metallic iron in the form of fine, bright, and non-elastic wire; the grease or paraffin oil used in coating for protection against moisture and oxidation (rust) must be removed previous to use. Wire in form of card teeth wastings is most convenient, purest and cheapest.

Allied Product:

1. *Ferri Ramenta. Iron Filings.*—Official, 1830–1860. Such as are wholly attracted by the magnet. Owing to the magnet not being a perfect purifier, as it attracts and takes up other substances, and owing to so much copper being present in nearly all samples, they are no longer used officially.

Ferrum Reductum. Reduced Iron.—(Syn., Quevenne's Iron, Iron reduced by Hydrogen, Iron by Hydrogen, Powder of Iron, Ferrum Hydrogenio Reductum, Ferrum Ope Hydrogenii Paratum; Br. Ferrum Redactum; Fr. Fer réduit par l'Hydrogène; Ger. Reduzirtes Eisen.)

Manufacture: Freshly prepared ferric hydroxide (or subcarbonate), thoroughly washed and dried, is put into the central portion of a glass tube, the ends being filled with asbestos and corked, each cork having a smaller glass tube; the tube is put into a furnace and brought to red heat. Through this tube is now passed pure dry hydrogen, made from zinc and H_2SO_4, which is continued until furnace and tube have cooled—$Fe_2O_3 + 6H + \text{heat} = 2Fe + 3H_2O$. It is a very fine, grayish-black, lustreless powder, odorless, tasteless, permanent, insoluble in water, alcohol. *Assay:* 0.56 Gm. + 50 Cc. mercuric chloride T. S., heat one hour on water-bath in well-stoppered bottle, agitating often, cool, add water q. s. 100 Cc., filter; to 10 Cc. of this add 10 Cc. dil. H_2SO_4 + $\frac{N}{10}$ potassium permanganate V. S. until a permanent red color is produced. The number of Cc. of V. S. multiplied by 10 indicates the p. c. of metallic iron. *Impurities:* Sulphide, arsenic. Dose, gr. 1–5 (.06–.3 Gm.), at meal-time, in pill, wafer.

Properties and Uses.—This was originally prepared as a substitute for the ferri subcarbonas, by Quevenne, of Paris. It is a chalybeate tonic, but very apt to derange the stomach, owing to formation of H_2S from the impurities.

Ferri Chloridum. Ferric Chloride, $Fe_2Cl_6 + 12H_2O$.—(Syn., Sesquichloride (Perchloride) of Iron, Ferrum Muriaticum Oxydatum, Chloridum (Chloruretum) Ferricum, Ferri Perchloridum; Fr. Perchlorure de Fer, Chlorure ferrique; Ger. Ferrum Sesquichloratum, Eisenchlorid.)

Manufacture: Iron 15 Gm., hydrochloric acid 87 Gm., nitric acid about 8 Gm., distilled water about 30 Cc. Dissolve iron in hydrochloric acid diluted, oxidize with nitric acid, evaporate to 60 Gm., let crystallize—(1) $Fe+2HCl=FeCl_2+H_2$. (2) $3FeCl_2+O=Fe_2Cl_6+FeO$. (3) $6FeCl_2+2HNO_3+6HCl=3Fe_2Cl_6+4H_2O+2NO$. It is in orange-yellow crystalline pieces, odorless or faint hydrochloric acid odor, styptic taste, soluble in water, alcohol, very deliquescent, hence keep in small pieces, dark, in well-stoppered bottles. *Assay:* 0.56 Gm. + 10 Cc. water, + 2 Cc. HCl + 1 Gm. KI; this mixture kept at 40° C. (104° F.) for half an hour, cooled, + a few drops starch T. S., should require 20 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or greenish color of the liquid (each Cc. of V. S. indicating 1 p. c. metallic iron). *Impurities:* Zinc, copper, fixed alkali salts, ferrous salt, oxychloride, nitric acid. Dose, gr. 1–5 (.06–.3 Gm.).

Preparations.—1. *Liquor Ferri Chloridi.* Solution of Ferric Chloride. (Syn., Liquor Ferri Muriatici Oxydati, Ferrum Sesquichloratum Solutum ; Br. Liquor Ferri Perchloridi Fortior; Fr. Soluté de Perchlorure de Fer, Chlorure ferrique liquide ; Ger. Liquor Ferri Sesquichlorati, Flüssiges Eisenchlorid (lösung).)

Manufacture: Iron, as bright wire, 15 Gm., hydrochloric acid 87 Gm., nitric acid about 8 Gm., distilled water (about 30 Cc.) q. s. 100 Gm. The iron wire is dissolved in hydrochloric acid diluted, oxidized from the ferrous to ferric chloride with HNO_3, evaporated, and enough water added for standard strength; chemical reaction same as in the preceding. It is a reddish-brown aqueous solution of Fe_2Cl_6 containing about 37.8 p. c. of anhydrous salt, corresponding to 62.9 p. c. of crystallized salt, $Fe_2Cl_6+12H_2O$, or about 13 p. c. metallic iron, faint hydrochloric acid odor, an acid, styptic taste, acid reaction, sp. gr. 1.387. *Assay* and *Impurities:* About the same as ferric chloride salt. Dose, ♏iij–10 (.2–.6 Cc.), well diluted with water or syrup.

Prep.: 1. *Tinctura Ferri Chloridi.* Tincture of Ferric Chloride. (Syn., Tinctura Ferri (Muriatis) Sesquichloridi; Br. Tinctura Ferri Perchloridi; Fr. Teinture de Perchlorure de Fer; Ger. Eisenchloridtinktur.)

Manufacture: Solution of ferric chloride 25 Cc., alcohol q. s. 100 Cc.; mix and let stand three months in covered vessel. It is a bright, brownish hydro-alcoholic solution of Fe_2Cl_6, containing about 13.6 p. c. of anhydrous salt, corresponding to 4.7 p. c. metallic iron, odor slightly ethereal, astringent, styptic taste, acid reaction, sp. gr. 0.960. *Assay* and *Impurities:* About the same as ferric chloride salt. Dose, ♏x–30 (.6–2 Cc.), well diluted with water.

Prep.: 1. *Liquor Ferri et Ammonii Acetatis.* Solution of Iron and Ammonium Acetate. (Syn., Mistura Ferri et Ammonii Acetatis, Basham's Mixture.)

Manufacture: To solution of ammonium acetate 20 Cc., which should not be alkaline, add successively diluted acetic acid 3, tincture of ferric chloride 2, aromatic elixir 10, glycerin 12, water q. s. 100 Cc. This should be freshly made when wanted, as it deteriorates by age. Dose, ʒj–4 (4–15 Cc.), diluted.

Properties and Uses.—Ferri Chloridum—powerful astringent, hæmostatic; chiefly used locally for stanching hemorrhage, as in epistaxis, hæmoptysis—by inhaling an atomized solution, leech bites, on gums after teeth extracted, uterine ulcers, scrofulous ulcers, lupoid skin diseases. This not near so much used as liquor and tincture. Liquor Ferri Chloridi—styptic, when injected into vessels it coagulates blood; used to cure varices, hemorrhages, incontinence of urine, vesical catarrh, leucorrhœa, injection for aneurisms, nasal polypi, erectile tumors; externally in varicose veins, hemorrhoids, vascular growths, ulcers, cancers, diphtheria, ophthalmia, chilblains, ingrown nails, ulcerated gums, gangrene, hydrocele, prolapsed rectum, sweating of the feet. Tinctura Ferri Chloridi—tonic in scrofula, diuretic; gleet, old gonorrhœa, leucorrhœa, dysury, hemorrhages of uterus, kidneys, bladder, erysipelas, scarlatina, diphtheria, purulent infection of the blood, venereal warts, cancerous, fungous ulcers, injection in aneurisms, sweats, puerperal fever, chilblains, poisoning by rhus toxicodendron, acute articular rheumatism. Liquor Ferri et Am. Acetatis—albuminuria, chronic Bright's disease. The astringency of these preparations can be neutralized with sodium bicarbonate or citrate. They as well as all other acid preparations should be taken through a glass tube, carefully avoiding the liquids coming into contact with the teeth. If this be impossible at times, the mouth should then be rinsed well with an alkaline water.

Allied Product:

1. *Ferrum Dialysatum. Dialyzed Iron.*—Obtained by saturating aqueous solution of ferric chloride with fresh ferric hydrate, putting into a dialyzer and suspending in water; all the acid passes through the septum, but very little iron. Used like tincture ferri chloridi, with the advantages of having no styptic taste, not staining teeth, nor constipating. Dose, ♏v–30 (.3–2 Cc.), diluted with water.

Ferri Iodidum Saccharatum. Saccharated Ferrous Iodide.—(Syn., Fr. Saccharure d'Iodure de Fer; Ger. Eisenjodürzucker, Ferrum Iodatum Saccharatum.)

Manufacture: Mix iron, as fine bright wire, 6 Gm., iodine 17, distilled water 20 Cc., shake occasionally until green color appears, filter this into sugar of milk 40 Gm., evaporate to dryness, stirring all the time, then add reduced iron 1 Gm. to retard decomposition, and milk sugar q. s. 100 Gm. It is a yellowish-white powder, very hygroscopic, odorless, sweet, ferruginous taste, soluble in 7 parts water, partially soluble in alcohol. *Assay:* 1.55 Gm. + 20 Cc. water + 22 Cc. $\frac{N}{10}$ silver nitrate V. S. + 5 Cc. dil. HNO_3 + 5 Cc. ferric ammonium sulphate T. S., this should require 2 Cc. $\frac{N}{10}$ potassium sulphocyanate V. S. to produce permanent reddish-brown tint (corresponding to 20 p. c. pure ferrous iodide). *Impurities:* Salts of the fixed alkalies, free iodine. Should be kept cool, dark, and in dried, well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.), ter die.

This salt could be made by simply evaporating the following *Syrupus Ferri Iodidi,* but some of the iodine, by such continued heat, is dissipated—the product is darker and not entirely soluble from the presence of some ferric oxide formed.

Syrupus Ferri Iodidi. Syrup of Ferrous Iodide.—(Syn., Fr. Sirop d'Iodure de Fer; Ger. Eisenjodürsirup, Sirupus Ferri Jodati.)

Manufacture: Mix iron, as fine bright wire, 2.5 Gm., iodine 8.3, distilled water 15 Cc., shake occasionally until green color appears, heat to boiling, and filter into syrup 60 Gm., wash filter with a mixture of hot syrup and water each 2.5 Cc., and add syrup q. s. 100 Gm. It is a transparent, syrupy liquid, containing about 10 p. c. by weight of ferrous iodide, FeI_2, or 13.4 Gm. in 100 Cc., sp. gr. 1.353, odorless, sweet, ferruginous taste, neutral reaction. *Assay:* About the same as saccharated ferrous iodide. *Impurities:* Free iodine, etc. Should be kept in small, well-stoppered, and completely filled bottles. Dose, ♏x–40 (.6–2.6 Cc.), in water, after meals.

Pilulæ Ferri Iodidi. Pills of Ferrous Iodide.—(Syn., Fr. Pilules d'Iodure de Fer, Pilules de Blancard; Ger. Eisenjodür-Pillen.)

Manufacture: To reduced iron 4 Gm. add water 6 Cc., then gradually iodine 5 Gm., triturating until red tint disappears, now, previously mixed, add glycyrrhiza (root) 4 Gm., sugar 4, extract of glycyrrhiza 1, acacia 1, evaporate to proper consistence, make into 100 pills; coat with balsam of tolu 10 Gm. dissolved in ether 15 Cc. *Impurities:* Free iodine, etc. Should be kept in well-stoppered bottles. Dose, 1–2 pills.

PROPERTIES AND USES.—All of the iodide of iron preparations are tonic, alterative, diuretic, emmenagogue; scrofula, anæmia from scrofula; tuberculosis or syphilis, skin affections, chronic rheumatism, amenorrhœa, leucorrhœa, swollen glands, secondary syphilis, etc.

Ferri Lactas. Ferrous Lactate, $Fe(C_3H_5O_3)_2 + 3H_2O$.—(Syn., Lactas Ferrosus; Fr. Lactate de Fer, Lactate ferreux; Ger. Milchsaures Eisenoxydul, Eisenlactat, Ferrum Lacticum, Ferrolaktat.)

Manufacture: Digest iron filings 15 Gm. in lactic acid 30 Cc. + water 500 until action ceases, filter, crystallize—$Fe_2 + 4HC_3H_5O_3 = 2Fe(C_3H_5O_3)_2 + 4H$, or by double decomposition between ferrous sulphate and calcium lactate. It is in pale-greenish-white crusts of small needle crystals, slightly peculiar odor, mild, sweetish, ferruginous taste, soluble in 40 parts water, insoluble in alcohol. *Impurities:* Metals, sulphate, chloride, citrate, tartrate, malate, sugar, gum, butyric acid, carbonized substances. Dose, gr. 1–5 (.06–.3 Gm.), in pill, lozenge, bread, water, or syrup.

PREPARATION.—1. *Syrupus Hypophosphitum cum Ferro,* 1 p. c. Dose, ʒj–2 (4–8 Cc.).

PROPERTIES AND USES.—Chalybeate, tonic. Owing to lactic acid being a normal animal secretion, this salt is supposed to be more easily assimilated than all others of iron, consequently it can be used with best hopeful results whenever the system needs the metal.

Ferri Sulphas. Ferrous Sulphate, $FeSO_4 + 7H_2O$.—(Syn., Green Vitriol, Copperas, Sulfas Ferrosus, Ferrum Vitriolatum Purum, Vitriolum Martis Purum; Fr. Sulfate (Protosulfate) de Fer, Sulfate ferreux; Ger. Schwefelsaures Eisenoxydul, Ferrum Sulfuricum, Ferrosulfat.)

Manufacture: Dissolve iron wire in diluted sulphuric acid, by the aid of heat, evaporate, crystallize—$Fe_2 + 2H_2SO_4 = 2FeSO_4 + H_4$. It is in large pale-bluish-green, monoclinic prisms, odorless, saline, styptic taste, efflorescent in dry air, while in moist air crystals rapidly absorb oxygen, becoming coated with brownish-yellow basic ferric sulphate, soluble in 1.8 parts water, insoluble in alcohol. When slowly heated to 115° C. (239° F.) crystals fall to powder, losing 38.84 p. c. by weight ($6H_2O$). *Assay:* 1.39 Gm. + 25 Cc. water + H_2SO_4 for acidity, hen 50 Cc. $\frac{N}{10}$ potassium permanganate V. S. should be required to produce permanent pink color (each Cc. of V. S. indicating 2 p. c. crystallized ferrous sulphate). *Impurities:* Copper, zinc, fixed alkali salts. Dose, gr. 1–5 (.06–.3 Gm.).

FIG. 430.

Ferrous sulphate crystal.

PREPARATIONS.—1. *Ferri Sulphas Exsiccatus.* Dried Ferrous Sulphate, $2FeSO_4 + 3H_2O$. (Syn., Fr. Sulphate (ferreux) de Fer desséché; Ger. Entwässsertes (Schwefelsaures Eisenoxydul) Ferrosulfat, Ferrum Sulfuricum Siccum.)

Manufacture: Ferrous sulphate 100 Gm. + heat on water-bath, with constant stirring until product weighs 65 Gm.; reduce to fine powder, and keep in well-stoppered bottles. It is a grayish-white powder, soluble in water. Dose, gr. ½–3 (.03–.2 Gm.).

Prep.: 1. *Pilulæ Aloes et Ferri,* 1 gr. (.06 Gm.) in each pill. Dose, 1–4 pills.

2. *Ferri Sulphas Granulatus.* Granulated Ferrous Sulphate, $FeSO_4 + 7H_2O$. (Syn., Ferri Sulphas Præcipitatus; Fr. Sulfate ferreux précipité; Ger. Præcipitirtes Ferrosulfat.)

Manufacture: Dissolve ferrous sulphate 100 Gm. in boiling distilled water 100 Cc., add diluted sulphuric acid 5 Cc., filter, evaporate to 150 Gm., when it will crystallize, drain crystals, pour upon them alcohol, 25 Cc., drain, dry quickly. The acid prevents oxidation of ferrous sulphate, the alcohol removes acid and uncombined water, hence facilitates drying. It is a pale-bluish-green crystalline powder, responding to tests of ferri sulphas. Should be kept in dry, well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.).

3. *Mistura Ferri Composita,* $\frac{3}{5}$ p. c. Dose, ℥j–2 (30–60 Cc.), ter die.

4. *Pilulæ Ferri Carbonatis,* 2½ gr. (.16 Gm.). Dose, 1–3 pills.

PROPERTIES AND USES.—Astringent, chalybeate, disinfectant. Overdoses give nausea, vomiting, griping, purging, gastric inflammation; often not dissolved, thus causing impaction, which is best removed by saline cathartics; hemorrhages, colliquative sweats, leucorrhœa, gleet, chronic diarrhœa, gastric catarrh, ulcers. With aloes relieves constipation. Externally, in ophthalmia, erysipelas. Ointment (dried sulphate 1 + lard 20) good in skin diseases, eczema, intertrigo, impetigo, syphilitic and scrofulous sores.

Allied Salt:

1. *Ferri Oxalas. Ferrous Oxalate,* FeC_2O_4,H_2O.—Official, 1880–

1890. Obtained by dissolving ferrous sulphate 62 Gm. in water 1,000 Cc., also oxalic acid 28 Gm. in water 500 Cc., filter and mix two solutions with agitation, wash and dry precipitate. It is a yellow crystalline powder, odorless, nearly tasteless, permanent, slightly soluble in water, soluble in HCl or hot dil. H_2SO_4. Dose, gr. 1–5 (.06–.3 Gm.).

Properties and Uses.—Very similar to all other ferruginous compounds, but weak and inefficient, hence little used.

Liquor Ferri Subsulphatis. Solution of Ferric Subsulphate.—(Syn., Solution of Basic Ferric Sulphate, Monsel's Solution, Solution of Persulphate (improperly) of Iron; Fr. Liqueur hémostatique de Monsel; Ger. Basisch-schwefelsaure Eisenoxydlösung, Monsel's Eisenlösung.)

Manufacture: Ferrous sulphate (crystals) 67.5 Gm., sulphuric acid 6.5 Gm., nitric acid about 6.5 Gm., distilled water q. s. 100 Gm. To the acids + water 50 Cc. + heat (100° Cc.; 212° F.) add sulphate, one-fourth at a time, boil and stir after each addition until effervescence ceases, finally add few drops of nitric acid to evolve all red fumes, then boil until free from nitrous odor. It is a clear ruby-red, aqueous solution of basic ferric sulphate ($Fe_4O(SO_4)_5$?) of variable chemical composition, but corresponding to 13.6 p. c. of metallic iron; nearly odorless, acid, styptic taste, acid reaction, sp. gr. 1.550. *Test:* 2 volumes + 1 vol. H_2SO_4 produces a solid white mass of anhydrous ferric sulphate upon standing (dif. from tersulphate). *Assay:* 1.12 Gm. + 15 Cc. water + 2 Cc. HCl + 1 Gm. KI; keep at 40° C. (104° F.) for thirty minutes, cool, add few drops starch T. S.; this should require 27.2 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or greenish color of the liquid (each Cc. of V. S. indicating 0.5 p. c. metallic iron). *Impurities:* Nitric acid, ferrous salts. Dose, ♏iij–10 (.2–.6 Cc.), well diluted. When physicians order solution of persulphate of iron this should be dispensed.

Properties and Uses.—Owing to its deficiency in H_2SO_4 this solution when evaporated yields a salt less irritating than the liquor tersulphatis, but with greater astringency. It was introduced in 1857 by M. Monsel to coagulate blood, hence in hemorrhages from cuts, wounds, where irritation is to be avoided, chancre, hæmoptysis, diarrhœa, hemorrhages of stomach, bowels, etc.

Liquor Ferri Tersulphatis. Solution of Ferric Sulphate.—(Syn., Solution of Persulphate of Iron, Solution of Normal Ferric Sulphate; Br. Liquor Ferri Persulphatis; Fr. Persulfate de Fer liquide; Ger. Flüssiges Schwefelsaures Eisenoxyd, Liquor Ferri Sulfurici Oxydati.)

Manufacture: Ferrous sulphate (crystals) 40 Gm., sulphuric acid 7.8 Gm., nitric acid about 5.5 Gm., distilled water q. s. 100 Gm. To the acids + water 20 Cc. + boiling, add sulphate, one-fourth at a time, boil and stir after each addition until effervescence ceases, finally add few drops of nitric acid to evolve all red fumes, then boil until free from nitrous odor—$6(FeSO_4 + 7H_2O) + 3H_2SO_4 + 2HNO_3 = 3Fe_2$-

$(SO_4)_3$ + 2NO + $46H_2O$, thus showing formation of normal salt, which is not the case in preceding liquor. It is a dark-reddish-brown aqueous solution of normal ferric sulphate, $Fe_2(SO_4)_3$, containing 28.7 p. c. of the salt, corresponding to 8 p. c. of metallic iron, almost odorless, acid, styptic taste, acid reaction, sp. gr. 1.320. This is recognized from Monsel's solution by having less sp. gr., lighter color, and not depositing Fe_2SO_4 upon adding half-volume H_2SO_4. *Test:* 2 vols. + 1 vol. H_2SO_4 should not produce solid white mass upon standing (dif. from subsulphate). *Assay:* 1.12 Gm. + 15 Cc. water + 2 Cc. HCl + 1 Gm. KI; keep at 40° C. (104° F.) for thirty minutes, cool, add few drops starch T. S.; this should require 16 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or greenish color of the liquid (each Cc. of V. S. indicating 0.5 p. c. metallic iron). *Impurities:* Nitric acid, ferrous salt.

Properties and Uses.—May use cautiously like preceding, but is more irritating, less astringent, externally may cause sloughing sores owing to contained acid; its greatest service as the base of most of our scale salts, also some other iron compounds.

Ferri et Ammonii Sulphas. Ferric Ammonium Sulphate, $Fe_2(NH_4)_2(SO_4)_4 + 24H_2O$.—(Syn., Ammonio-ferric Sulphate, Ammonio-ferric Alum, Alumen Ammoniacale Ferricum, Ferrum Ammonio Sulphuricum; Fr. Sulfate de Fer et d'Ammoniaque, Alun de Fer ammoniacal; Ger. Schwefelsaures Eisenoxyd-Ammonium, Ammoniakalischer Eisenalaun, Ferrum Sulfuricum Oxydatum Ammoniatum.)

Manufacture: Solution of ferric sulphate 1,000 Cc. + ammonium sulphate 140 Gm. + heat until dissolved, set aside to crystallize, wash and dry crystals quickly; keep in well-stoppered bottles. It is in pale-violet octahedral crystals, odorless, acid, styptic taste, efflorescent, soluble in 3 parts water, insoluble in alcohol. *Assay:* Dissolve 0.56 Gm. in 15 Cc. water + 2 Cc. HCl + 1 Gm. KI; this kept at 40° C. (104° F.) for thirty minutes, cooled, + few drops of starch T. S. should require 11.6 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or green color (each Cc. of V. S. indicating 1 p. c. metallic iron). Dose, gr. 5–10 (.3–.6 Gm.), ter die.

Properties and Uses.—Astringent, styptic; hemorrhages, leucorrhœa, chronic mucous fluxes of bowels, vagina, bronchia.

Liquor Ferri Citratis. Solution of Ferric Citrate.—(Syn., Citras Ferricus Liquidus; Fr. Citrate de Fer liquide; Ger. Eisencitrat-Lösung, Flüssiges Eisencitrat.)

Manufacture: Mix ammonia water 88 Cc. with cold water 300, also mix solution of ferric sulphate 105 Gm. with cold water 1,000 Cc., add latter solution to former, strain, add precipitate to cold water 600 Cc., strain, repeat washing until no sulphate present, heat precipitate with citric acid 30 Gm., stirring until dissolved, evaporate to 100 Gm. It is a dark-brown aqueous solution of ferric citrate, containing 32.85 p. c. anhydrous salt, $Fe_2(C_6H_5O_7)_2$, corresponding to about 7.5 p. c. metallic iron, odorless, ferruginous taste, sp. gr. 1.250. *Tests:* 1.

Evaporating 100 Gm. on glass plates yields 42.5 Gm. ferric citrate in garnet-red scales. 2. It is not precipitated by ammonia water, but the solution is simply darkened. 3. It is precipitated with NaOH or KOH. *Assay:* Same as liquor ferri tersulphatis, only it should require 15 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge the color *Impurities:* Tartrate, etc. Dose, ♏v–15 (.3–1 Cc.).

PROPERTIES AND USES.—Ferruginous tonic; anæmia, chlorosis.

Ferri Citras. Ferric Citrate, $Fe_2(C_6H_5O_7)_2,6H_2O$.—(Syn., Citras Ferricus; Fr. Citrate de Sesquioxyde de Fer, Citrate ferrique; Ger. Citronensaures Eisenoxyd, Eisencitrat, Ferrum Citricum Oxydatum, Ferricitrat.)

Manufacture: Solution of ferric citrate 100 Gm., evaporate on water-bath at 60° C. (140° F.) to the consistence of syrup, and spread on glass plates to dry in scales; yield 42.5 Gm. It is in thin, transparent garnet-red scales, odorless, slight ferruginous taste, soluble in water, insoluble in alcohol; when heated chars into ferric oxide. *Assay:* Same as liquor ferri tersulphatis, except 0.56 Gm. of the salt is taken, which should require 16 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge the blue or greenish color (each Cc. of V. S. indicating 1 p. c. metallic iron). Should be kept dark, in well-stoppered bottles. Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—Mild tonic for delicate stomachs and children; can be taken fasting or with food.

Ferri et Quininæ Citras. Iron and Quinine Citrate.—(Syn., Citras Ferrico-quinicus; Fr. Citrate de Fer et de Quinine; Ger. Citronensaures Eisen-Chinin, Ferri-chinin Citrat, Eisen-chinin Citrat, Chininum Ferro-Citricum.)

Manufacture: Ferric citrate 85 Gm., dissolve with heat in distilled water 160 Cc., to this add quinine (dried) 12 Gm. + citric acid 3 Gm., previously triturated with distilled water 20 Cc.; stir until dissolved, evaporate to syrup, dry on glass. It is in thin, transparent, reddish-brown scales, odorless, bitter, ferruginous taste; soluble in water, which is diminished by age, partially in alcohol, deliquescent. *Assay:* Quinine: Dissolve 1.12 Gm. in 20 Cc. water + heat, cool, put into a separator + 5 Cc. ammonia water + chloroform 10 Cc.; shake, allow liquid to separate, pour off chloroform-layer, shake twice more with chloroform, 10 Cc. each time, mix solutions, evaporate; residue should weigh .1288 Gm. (corresponding to 11.5 p. c. of dried quinine). Iron: Heat aqueous solution, from which quinine has been removed, on water bath, until chloroform and ammonia are dissipated, cool, add water q. s. 50 Cc.; now 25 Cc. of this, after the process for liquor ferri tersulphatis, should require 14.5 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge the bluish color (each Cc.

of V. S. indicating 1 p. c. metallic iron). *Impurities:* Citrates or tartrates of the fixed alkalies. Should be kept in dark, well-stoppered bottles. Dose, gr. 3–10 (.2–.6 Gm.).

PROPERTIES AND USES.—Ferruginous tonic; anæmia, etc.

Ferri et Quininæ Citras Solubilis. Soluble Iron and Quinine Citrate.

Manufacture: Ferric citrate 85 Gm., dissolve by heat in distilled water 160 Cc., add quinine (dried) 12 Gm. + citric acid 3 Gm., previously triturated with distilled water 20 Cc.; stir until dissolved, then add, constantly stirring, ammonia water 50 Cc. and liquid turns greenish-yellow, evaporate to syrup, dry on glass. It is in thin, transparent greenish, or yellowish scales, odorless, bitter, ferruginous taste, deliquescent, soluble in water, partially in alcohol. Corresponds to all reactions of the preceding and has same strength. Should be kept in dark, well-stoppered bottles. Dose, gr. 3–10 (.2–.6 Gm.), in pill, solution, before meals.

Prep.: 1. *Vinum Ferri Amarum.* Bitter Wine of Iron. (Syn., Fr. Vinum de Cinchona Martiatum, Vin (Oenolé) de Quinquina ferrugineux; Ger. Chinæisenwein, Bitter Eisenwein, Vinum Chinæ Ferratum.)

Manufacture: Dissolve soluble iron and quinine citrate 5 Gm. in white wine 50 Cc., add tincture of sweet-orange peel 15, syrup 30, white wine q. s. 100 Cc., filter after several days. Dose, ʒj–2 (4–8 Cc.).

PROPERTIES AND USES.—Tonic; combines the properties of both ingredients in convenient form; taken preferably in pills. Wine—mild ferruginous tonic, anæmia, debility.

Ferri Phosphas Solubilis. Soluble Ferric Phosphate.—(Syn., Ferri Phosphas, Ferri et Sodii Citro-phosphas, Ferrum Phosphoricum Cum Natrio Citrico, Sodio-ferric Citro-phosphate; Fr. Citro-phosphate de Fer et de Soude; Ger. Natrium ferri-citro-phosphat.)

Manufacture: Ferric citrate 50 Gm., dissolve by heat in distilled water 100 Cc., to this add sodium phosphate (uneffloresced) 55 Gm., stirring until dissolved, evaporate to syrup, dry on glass. It is in thin, bright-green, transparent scales, odorless, acid, saline taste, darkens with age, soluble in water, insoluble in alcohol. *Tests:* With potassa or soda T. S. get reddish precipitate, to the filtrate add HCl + magnesia mixture + ammonia water in excess, get white precipitate; to this filtrate add acetic acid, then heat, should have no further precipitation (abs. of pyrophosphate). *Assay:* Same as in ferric citrate except 12 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. are required to discharge blue or green color (each Cc. of V. S. indicating 1

p. c. metallic iron). *Impurities:* Pyrophosphate, etc. Should be kept in dark-amber, well-stoppered bottles. Dose, gr. 3–10 (.2–.6 Gm.).

Prep.: 1. *Syrupus Ferri, Quininæ et Strychninæ Phosphatum.* Syrup of the Phosphates of Iron, Quinine, and Strychnine. (Syn., Syrupus Eatoni, Eaton's Syrup, Aitkin's Syrup, Syrup of the Three Phosphates, Syrup of Triple Phosphates, Syrupus Ferri Phosphorici cum Chinino et Strychnino; Fr. Sirop tonique d'Eaton; Ger. Eaton's-sirup.)

Manufacture: Soluble ferric phosphate 2 Gm., dissolve with heat in water 5 Cc., to this add phosphoric acid 4.8 Cc., quinine sulphate 3 Gm., strychnine .02 Gm.; stir until dissolved, filter into glycerin 10 Cc., add syrup q. s. 100 Cc. Dose, ʒj–2 (4–8 Cc.).

PROPERTIES AND USES.—Good chalybeate; owing to acceptable taste can be given in any form. Syrup—food-tonic.

Ferri Pyrophosphas Solubilis. Soluble Ferric Pyrophosphate.—(Syn., Ferri Pyrophosphas, Pyrophosphate of Iron with Sodium (Ammonium) Citrate, Sodio-ferric Citro-pyrophosphate, Pyrophosphas Ferricus cum Citrate Sodico, Ferrum Pyrophosphoricum cum Ammonio Citrico; Fr. Citro-pyrophosphate de Fer et de Soude; Ger. Pyrophosphorsaures Eisenoxyd mit Citronensauren Natron.)

Manufacture: Ferric citrate 50 Gm., dissolve with heat in distilled water 100 Cc., to this add sodium pyrophosphate 50 Gm., stirring constantly until dissolved; evaporate to syrup, dry on glass. It is in thin, apple-green transparent scales, odorless, acid saline taste, darkens with age, soluble in water, insoluble in alcohol. *Tests:* With potassa or soda T. S. get reddish-brown precipitate, to the filtrate add HCl + magnesia mixture + ammonia water in excess, should get no precipitate (distinction from and abs. of ferric phosphate); to this filtrate add acetic acid, heat, and get white flocculent precipitate—pyrophosphate. *Assay:* Dissolve 0.56 Gm. in 10 Cc. water, add 10 Cc. HCl + water 40 Cc. + 1 Gm. KI, this kept at 40° C. (104° F.) for thirty minutes, cooled + few drops starch T. S.; now 10 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. should discharge blue or green color (each Cc. of V. S. indicating 1 p. c. metallic iron). *Impurities:* Ferric phosphate, etc. Should be kept in dark-amber, well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.).

PROPERTIES AND USES.—Good chalybeate; anæmia, etc.

Ferri et Ammonii Citras. Iron and Ammonium Citrate.—(Syn., Ammonio Ferric Citrate, Ferro Ammonium Citricum, Soluble Citrate of Iron; Fr. Citras Ammonico-ferricus, Citrate de Fer et d'Ammoniaque (de Fer Ammoniacal); Ger. Citronensaures Eisenoxyd Ammonium (Ammoniak), Ferri-ammoncitrat.)

Manufacture: Solution of ferric citrate 100 Cc. + ammonia water 40 Cc.; mix, evaporate at 60° C. (140° F.) to syrup, dry on glass. It is in thin, transparent, garnet-red scales, odorless, saline, ferruginous taste, deliquescent, soluble in water, insoluble in alcohol, chars into ferric oxide, not precipitated, only darkened by ammonia water, but is precipitated with NaOH or KOH. *Tests:* With potassium ferrocyanide T. S. get no blue color or precipitate unless HCl added (difference from ferric citrate). *Assay:* Same as with ferric citrate, requiring 16 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or greenish color (each Cc. of V. S. indicating 1 p. c. metallic iron). *Impurities:* Citrates or tartrates of the fixed alkalies. Should be kept dark, in well-stoppered bottles. Dose, gr. 3–10 (.2–.6 Gm.).

PREPARATIONS.—1. *Ferri et Strychninæ Citras.* Iron and Strychnine Citrate. (Syn., Fr. Citrate de Fer et de Strychnine; Ger. Citronensaures Eisen-Strychnin.)

Manufacture: Iron and ammonium citrate 98 Gm., dissolve in distilled water 100 Cc., strychnine 1 Gm. + citric acid 1 Gm., dissolve in distilled water 20 Cc., mix, evaporate to syrup, dry on glass. It is in thin, transparent, garnet-red to yellowish-brown scales, odorless, bitter, ferruginous taste, deliquescent, soluble in water, partially in alcohol; contains 1 p. c. strychnine and 16 p. c. metallic iron. Chars into ferric oxide, which should not be alkaline (abs. of citrates or tartrates of the fixed alkalies). *Assay:* Strychnine: Dissolve 2.24 Gm. in a separator with 15 Cc. water, add 5 Cc. ammonia water + 10 Cc. chloroform, shake, pour off chloroform-layer, shake twice more, each time with 10 Cc. chloroform, mix chloroformic solutions, allow to evaporate at 100° C. (212° F.) until dry; this residue should weigh .02–.0224 Gm. (corresponding to .9–1 p. c. strychnine). Iron: Heat the aqueous liquid, from which the strychnine has been removed, on water-bath until all chloroform and ammonia odors are dissipated, cool, add water q. s. 100 Cc.; now take of this 25 Cc. and proceed as in liquor ferri tersulphatis; this should require 16 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or greenish color (each Cc. of V. S. indicating 1 p. c. metallic iron). Should be kept dark, in well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.), in pill or solution.

2. *Vinum Ferri Citratis.* Wine of Ferric Citrate. (Syn., Fr. Vinum Chalybeatum, Vin chalybé, Vin (Oenolé) ferrugineux; Ger. Eisenwein.)

Manufacture: Dissolve iron and ammonium citrate 4 Gm. in white wine 70 Cc., add tincture of sweet-orange peel 15 Cc., syrup 10, white wine q. s. 100 Cc., filter after several days. Dose, ʒj–4 (4–15 Cc.).

PROPERTIES AND USES.—Tonic; chlorosis, anæmia, etc.

Ferri et Ammonii Tartras. Iron and Ammonium Tartrate (Ammonio-ferric Tartrate).—(Syn., Ferrum Tartaricum Ammoniatum, Ferri Ammonio-tartras, Ammonio-tartrate of Iron; Fr. Tartrate ferrique Ammoniacal, Tartrate de Fer et d'Ammoniaque; Ger. Weinsaures Eisenoxyd Ammonium, Ferri-ammontartrat.)

Manufacture: Solution of ferric sulphate 100 Cc., ammonia water 110 Cc. to precipitate, also q. s. to neutralize one-half of the tartaric acid, tartaric acid 29 Gm., distilled water 200 Cc., water 3,000, also q. s. for washing. It is in thin, transparent, garnet-red or reddish-brown scales, odorless, sweetish, ferruginous taste, deliquescent, soluble in water, insoluble in alcohol; contains 17 p. c. metallic iron. *Tests:* 1. Chars into ferric oxide with burnt sugar odor; this residue should not be alkaline (abs. of citrates or tartrates of the fixed alkalies). 2. It is not precipitated but simply darkened by ammonia water. 3. Heated with NaOH or KOH get a reddish precipitate and ammonia vapors. *Assay:* Same as in ferric citrate except 17 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. are required to discharge blue or greenish color (each Cc. of V. S. indicating 1 p. c. metallic iron). Should be kept dark, in well-stoppered bottles. Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—Mild chalybeate; anæmia, etc.

Ferri et Potassii Tartras. Iron and Potassium Tartrate (Potassio-ferric Tartrate).—(Syn., Ferri Potassio-Tartras, Ferrum Tartarizatum (Tartaratum), Tartras (Ferrico-Potassicus) Ferrico-Kalicus, Ferro-Tartrate of Potassium; Tartarated (Tartarized) Iron; Fr. Tartrate de Fer et de Potasse, Tart(a)re chalybé, Tartre martial; Ger. Weinsaures Eisenoxyd-Kali, Eisenweinstein, Tartarus Ferratus.)

Manufacture: Solution of ferric sulphate 100 Cc., potassium bitartrate 38 Gm., distilled water 300 Cc., ammonia water 110 Cc., also q. s. to dissolve the precipitate; water 3,050 Cc., also q. s. for washing; contains 15 p. c. metallic iron. It is in thin, transparent garnet-red to reddish-brown scales, odorless, sweetish ferruginous taste, deliquescent, soluble in water, insoluble in alcohol. *Tests:* 1. Chars into ferric oxide with burnt sugar odor; this residue is alkaline, and effervesces with acids (distinction from iron and ammonium tartrates). 2. It is not precipitated but simply darkened by ammonia water. 3. With NaOH or KOH get a reddish precipitate and ammonia vapors. *Assay:* Same as in ferric citrate, except 15 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. are required to discharge blue or greenish color (each Cc. of V. S. indicating 1 p. c. metallic iron). Should be kept dark, in well-stoppered bottles. Dose, gr. 5–15 (.3–1 Gm.), ter die.

PROPERTIES AND USES.—One of the richest in iron, most agreeable tasted, least constipating, irritating to stomach and bowels, of iron salts.

Ferri Oxydum Hydratum. Ferric Hydrate, $Fe_2(OH)_6$.—(Syn., Ferric Hydroxide (Oxyhydrate), Hydrated Oxide of Iron, Ferri Sesquioxidum (Oxidum Rubrum), Hydrated (Peroxide) Sesquioxide of Iron, Hydras Ferricus, Ferrugo; Br. Ferri Peroxidum Hydratum; Fr. Sesquioxide (Péroxide) de Fer hydraté humide, Hydrate de Péroxyde de Fer gélatineux; Ger. Feuchtes Eisenoxydhydrat, Gegengift der Arsenigensäure.)

Manufacture: Solution of ferric sulphate 100 Cc., ammonia water

110 Cc., water q. s. for dilution (1,250 Cc.), washing magma, and finally to make 250 Gm. To the ammonia water, diluted, the iron solution is added, being previously well diluted, wash precipitate, add water q. s. for 250 Gm.; if order reversed, have basic ferric sulphate formed. When this is wanted against arsenous acid poisoning, and one is in a hurry, much washing can be dispensed with, as the retained ammonia serves as a stimulant, and thus may neutralize some of the depressant effects of the poison. It is a brownish-red magma, soluble in hydrochloric acid without effervescence. Dose, ℥j–4(4–15 Gm.).

PREPARATIONS.—1. *Emplastrum Ferri.* Iron Plaster (Strengthening Plaster). (Syn., Chalybeate Plaster, Emplastrum (Ferratum) Martiale; Br. Emplastrum Roborans; Fr. Emplâtre (d'Oxyde rouge de Fer) de Canet; Ger. Eisenpflaster, Stärkendes Pflaster.)

Manufacture: Melt lead plaster 72 Gm., Burgundy pitch 14, then add olive oil 5 Gm., and ferric hydrate 9, stir until cool.

2. *Trochisci Ferri.* Troches of Iron. (Syn., Fr. Pastilles d'Oxide de Fer, Tablettes (Pastilles) de l'hydrate de Fer; Ger. Ferrihydratpastillen, Eisenoxyd-pastillen.)

Manufacture: Ferric hydrat (dried) 30 Gm., vanilla 1, sugar 100, mucilage of tragacanth q. s. 100 troches. Dose, 1–6 troches.

PROPERTIES AND USES.—Solely as antidote to arsenic poisoning, possibly inferior to saccharated oxide; although it acts by combination, yet it is thought largely to envelop the poison mechanically thereby keeping it from being absorbed, hence must empty stomach shortly after giving it; should always freshly prepare this, as it becomes inefficient by age. Plaster—is stimulant, protective, support, rheumatism, pleurisy, enlarged glands.

Ferri Oxidum Hydratum cum Magnesia. Ferric Hydrate with Magnesia (Arsenic Antidote).—(Syn., Hydrated Oxide of Iron with Magnesia, Antidotum Arsenici, Antidote to Arsenous Acid; Fr. Contre-poison de l'Arsenic; Ger. Gegengift (des Arseniks) der Arsenigensäure.)

Manufacture: Solution of ferric sulphate 50 Cc., add to this water 100 Cc.; magnesia 10 Gm., add to this water 750 Cc. Keep in separate bottles, and when wanted shake magnesia mixture and add to it the iron solution. A more available preparation than the preceding.

USES.—As an antidote to arsenic in large doses, made up freshly.

Ferri Valerianas. Ferric Valerianate, $Fe_2(C_5H_9O_2)_6$.—(Syn., Ferrum Valerianicum, Valerianate of Iron; Fr. Valérianate de Fer; Ger. Baldriansaures Eisenoxyd, Ferri-valerianat.)

Manufacture: Precipitate diluted solution of ferric sulphate (or chloride) by adding cold solution of sodium valerianate, wash precipitate, then dry. It is a dark brick-red amorphous powder, of varying composition, with valerianic acid odor, styptic taste, permanent, insoluble in cold water, soluble in alcohol; chars into ferric oxide, giving off inflammable vapors of butyric acid odor; contains 15–20 p. c. metallic iron. *Assay:* Same as in ferri et ammonii sulphas, except it requires 15–20

Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or green color (each Cc. of V. S. indicating 1 p. c. metallic iron). Should be kept cool, dark, and in small, well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.).

Properties and Uses.—Chalybeate tonic, anæmia, nervous exhaustion, hysteria, diabetes insipidus.

Liquor Ferri Nitratis. Solution of Ferric Nitrate.—(Syn., Br. Liquor Ferri Pernitratis; Fr. Azotate (Pernitrate) de Fer liquide; Ger. Eisennitrat-Lösung, Ferrinitrat-Lösung.)

Manufacture: Solution of ferric sulphate 18 Gm., precipitate this with ammonia water 16 Cc., both solutions being well diluted before mixing (150 and 50 Cc. water respectively); wash precipitate well, and dissolve in nitric acid 7.1 Gm., adding distilled water q. s. 100 Gm. It is a clear aqueous amber or reddish solution of ferric nitrate, $Fe_2(NO_3)_6$, containing about 6.2 p. c. anhydrous salt, corresponding to 1.4 p. c. metallic iron, odorless, acid, styptic taste, acid reaction, sp. gr. 1.050. *Assay:* Same as for liquor ferri tersulphatis, except it requires 2.8 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or green color (each Cc. of V. S. indicating 0.5 p. c. metallic iron). Dose, ♏iij–10 (.2–.6 Cc.), diluted; injection 2–5 p. c., in water.

Properties and Uses.—Astringent, tonic, chronic diarrhœa, mucous diarrhœa, menorrhagia, leucorrhœa.

Liquor Ferri Acetatis. Solution of Ferric Acetate.—(Syn., Solution of Peracetate of Iron; Fr. Acétate ferrique liquide; Ger. Ferriacetat-Lösung, Liquor Ferri Acetici, Eisenacetat-Lösung.)

Manufacture: Solution of ferric sulphate 100 Gm., diluted with water 1,000 Cc., is added to ammonia water 85 Cc. diluted with water 300 Cc., wash precipitate well with boiling water, dry to 70 Gm., and add it to glacial acetic acid 26 Gm., adding distilled water q. s. 100 Gm.—(1) $Fe_2(SO_4)_3 + 6NH_4OH = Fe_2(OH)_6 + 3(NH_4)_2SO_4$. (2) $Fe_2(OH)_6 + 6HC_2H_3O_2 = Fe_2(C_2H_3O_2)_6 + 6H_2O$. It is a dark reddish-brown, clear aqueous solution of ferric acetate, $Fe_2(C_2H_3O_2)_6$, containing 31 p. c. of the anhydrous salt, corresponding to 7.5 p. c. metallic iron; acetous odor, sweetish, acidulous styptic taste, acid reaction, sp. gr. 1.160. *Assay:* Same as for liquor ferri tersulphatis, except it requires 15 Cc. $\frac{N}{10}$ sodium hyposulphite V. S. to discharge blue or green color (each Cc. of V. S. indicating 0.5 p. c. metallic iron). *Impurities:* Zinc, copper, salts of the fixed alkalies, ferrous salt. Should be kept cool, dark, in well-stoppered bottles. Dose, ♏iij–10 (.2–.6 Cc.).

Properties and Uses.—Good chalybeate, tonic, also useful astringent and styptic both internally and externally; may be given as arsenous acid antidote.

Ferri Carbonas Saccharatus. Saccharated Ferrous Carbonate, $FeCO_3$.—(Syn., Carbonas Ferrosus Saccharatus; Fr. Saccharure (de carbonate ferreux) de Proto-carbonate de Fer; Ger. Zuckerhaltiges (Kohlensaures Eisen) Ferro-carbonat, Ferrum Carbonicum Saccharatum.)

Manufacture: Dissolve ferrous sulphate 50 Gm. in hot distilled water 200 Cc.; also sodium bicarbonate 35 Gm., in distilled water 500 Cc., filter both solutions and add former to latter, wash thoroughly the precipitate with hot distilled water, strain, mix with sugar 80 Gm., evaporate, powder, add sugar q. s. 100 Gm.—$(FeSO_4 + 10H_2O) + 2NaHCO_3 = FeCO_3 + Na_2SO_4 + CO_2 + 11H_2O$; contains 15 p. c. ferrous carbonate. It is a greenish-brown powder, oxidizing by age, odorless, taste sweetish then ferruginous, partially soluble in water, entirely so in HCl. *Assay:* Dissolve 1.16 Gm. in 10 Cc. dil. H_2SO_4 + water q. s. 100 Cc., this requires 15 Cc. $\frac{N}{10}$ potassium permanganate V. S. to give permanent pink tint (each Cc. of V. S. indicating 1 p. c. pure ferrous carbonate). *Impurities:* Sulphate, ferrous oxide. Should be kept in small, well-stoppered bottles. Dose, gr. 5–15 (.3–1 Gm.), in pill.

PROPERTIES AND USES.—Takes the place of subcarbonate and iron-rust in anæmia, chlorosis, neuralgia, chorea.

Allied Salt:

1. *Ferri Subcarbonas. Subcarbonate of Iron,* $Fe_2O_3,Fe_2(OH)_6$.—Official, 1840–1880. Made by mixing iron sulphate 225 Gm., dissolved in water 2,000 Cc., with sodium carbonate 250 Gm., dissolved in water 2,000 Cc., wash and dry the precipitate without heat. It is a reddish-brown powder, soluble in diluted HCl with slight effervescence; when dried by heat dissolves with difficulty in dil. HCl, as it then consists chiefly of the oxyhydrate, $Fe_2O_2,(OH)_2$. On exposure takes up oxygen, thus losing its original character and becoming a more insoluble oxide. Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—Chalybeate tonic; anæmia, anæmic chlorosis, chorea, neuralgia, ulcers, in emergency for arsenous acid poisoning—acts here mechanically and by combination; now replaced by ferri carbonas saccharatus.

Massa Ferri Carbonatis. Mass of Ferrous Carbonate (Vallet's Mass).—(Syn., Pill of Carbonate of Iron, Vallet's Ferruginous Pills, Pilulæ Ferratæ Valleti; Br. Pilula Ferri Carbonatis; Fr. Masse pilulaire de Vallet—de Carbonate ferreux, Pilules de Carbonate ferreux—ferrugineuses; Ger. Vallet'sche Pillen-masse, Pilulæ Ferri Carbonici.)

Manufacture: Dissolve ferrous sulphate (crystals) 100 Gm. in hot distilled water 200 Cc.; also sodium carbonate in hot distilled water 200 Cc., to former solution add syrup 20 Cc., filter both solutions, add former to latter, wash precipitate with mixture of syrup (1) and water (19), drain, mix precipitate with clarified honey 38 Gm., sugar 25, evaporate, constantly stirring, to 100 Gm.—$(FeSO_4 + 7H_2O) + (Na_2CO_3 + 10H_2O) = FeCO_3 + Na_2SO_4 + 17H_2O$; contains about 42 p. c. ferrous carbonate. It is unchangeable, non-astringent, soluble in acids. Dose, gr. 1–5 (.06–.3 Gm.), in pill, after meals.

PROPERTIES AND USES.—Tonic; anæmia, chlorosis, etc.

Mistura Ferri Composita. Compound Iron Mixture (Griffith's

Mixture).—(Syn., Fr. Mixture de Griffith; Ger. Griffith's Eisenmixtur.)

Manufacture: Rub until uniform myrrh 1.8 Gm., sugar 1.8, potassium carbonate .8, with rose water 70 Cc., add spirit of lavender 6, then ferrous sulphate (crystals) 6 Gm. previously dissolved in rose water 5 Cc., finally rose water q. s. 100 Cc. It is a dark-green mixture, containing ferrous carbonate resulting from double decomposition of the two salts used. It should be freshly made when wanted. Dose, ℥j–2 (30–60 Cc.), ter die.

PROPERTIES AND USES.—Good tonic in debility of digestive organs, chlorosis, hysteria, phthisis, chronic catarrh.

Pilulæ Ferri Carbonatis. Pills of Carbonate of Iron.—(Syn., Ferruginous Pills, Chalybeate Pills, Blaud's Pills; Br. Pilula Ferri, Pills of Iron; Fr. Pilules (chalybés de Blaud—de Fer et de Myrrhe composées) de Griffith; Ger. Blaud'sche (Griffith'sche) Pillen.)

Manufacture: Rub potassium carbonate 8 Gm. with glycerin and water each 10 drops, add ferrous sulphate (crystals) 16 Gm. and sugar 4, previously triturated together, beat mass until greenish, when reaction over, add tragacanth 1 Gm., althæa 1, make into mass with water, divide into 100 pills. These pills contain each about 1 gr. (.06 Gm.) ferrous carbonate in a fresh state, resulting from double decomposition of the two salts. Dose, 1–2 pills.

PROPERTIES AND USES.—Tonic in debility of digestive organs, chlorosis, hysteria, phthisis, chronic catarrh.

Ferri Hypophosphis. Ferric Hypophosphite, $Fe_2(PH_2O_2)_6$.—(Syn., Ferrum Hypophosphorosum, Hypophosphis Ferricus, Hypophosphite of Iron; Fr. Hypophosphite de Fer; Ger. Unterphosphorigsaures Eisenoxyd, Ferri hypophosphit.)

Manufacture: Sodium hypophosphite solution is added to ferric chloride (or sulphate) solution, precipitate washed, dried with moderate heat—$6NaPH_2O_2 + 2FeCl_6 = Fe_2(PH_2O_2)_6 + 6NaCl$. Can also be made from iron sulphate and calcium hypophosphite. Here the solution contains ferrous hypophosphite, which on evaporation becomes ferric. It is a whitish powder, odorless, nearly tasteless, permanent, slightly soluble in water, when heated get inflammable hydrogen phosphide gas and ferric pyrophosphate. *Assay:* 0.1 Gm. + 10 Cc. water + 10 Cc. dil. H_2SO_4 + 50 Cc. $\frac{N}{10}$ potassium permanganate V. S. boiled 15 minutes, should require 3 Cc. $\frac{N}{10}$ oxalic acid V. S. to discharge red color (corresponding to 98.1 p. c. pure salt). *Impurities:* Carbonate, phosphate, calcium. Should be kept in well-stoppered bottles. Dose, gr. 3–10 (.2–.6 Gm.), in pill, powder, syrup.

PROPERTIES AND USES.—In anæmia, defective nerve-nutrition.

Allied Salts:

1. *Ferri Arsenas, Iron Arsenate.* Dose, gr. $\frac{1}{10}$–$\frac{1}{2}$ (.006–.03 Gm.). 2. *Ferri Bromidum, Ferrous Bromide.* Dose, gr. 1–3 (.06–.2 Gm.); syrup, ♏xv–30 (1–2 Cc.). 3. *Ferri Ferrocyanidum, Ferric Ferrocyanide.* Dose, ʒss–1 (2–4 Gm.). 4. *Ferri Sulphidum, Ferrous Sulphide;* used only for producing hydrogen sulphide.

Condensed Table giving basal iron preparations and products therefrom; each single one, or set included within bracket, to right of its equation mark being manufactured from that individual product preceding it.

Ferrum =

- I. Liq. Fe Chlor. =
  - 1. Ferri Chloridum.
  - 2. Tr. Fe Chlor. = Liq. Fe et Am. Acetatis (Basham's Mixture), 2 p. c.
  - 3. Fe Hypophosphis (Pp. with Na Hypophosphite).
- II. Syr. Fe Iod. = Fe Iod. Saccharatum (20 p. c. FeI_2) = Pil. Fe Iod. (Blancards').
- III. Fe Lactate. = Syr. Hypophosphitum cum Ferro, 1 p. c.
- IV. Fe Sulph. =
  - 1. Fe Sulph. Exsic. = Pil. Aloes et Ferri.
  - 2. Fe Sulph. Gran.
  - 3. Fe Oxalas.
  - 4. Liq. Fe Subsulph.
  - 5. Liq. Fe Tersulphatis. =
    - 1. Fe et Am. Sulph.
    - 2. Liq. Ferri Citratis. =
      - 1. Fe Cit. =
        - 1. Fe et Quin. Cit.
        - 2. Fe et Quin. Cit. Sol. = Vin. Fe Amara.
        - 3. Fe Phos. Sol. = Syr. Fe Q. et S Phos.
        - 4. Fe Pyrophos. Sol.
      - 2. Fe et Am. Cit. =
        - 1. Fe et Strych. Cit.
        - 2. Vin. Fe Cit.
    - 3. Fe et Am. Tart.
    - 4. Fe et K Tart.
    - 5. Fe Oxidum-hydratum. =
      - 1. Reductum.
      - 2. Emplastrum.
      - 3. Trochisci.
    - 6. Fe Oxi-hyd. cum MgO.
    - 7. Fe Valerianas.
    - 8. Liq. Fe Nit.
    - 9. Liq. Fe Acet.
    - 10. Fe Ferrocyanidum.
    - 11. Ferrum Dialysatum.
  - 6. Fe Carb. Sacch.
  - 7. Fe Subcarb.
  - 8. Massa Fe Carb.
  - 9. Mist. Fe Carb.
  - 10. Pil. Fe Carb.
  - 11. Fe Hypophosphis.
  - 12. Fe Arsenas.
- V. Fe Brom.
- VI. Syr. Fe Brom. (10 p. c. $FeBr_2$).
- VII. Fe Sulphidum.

MANGANUM. MANGANESE.

$Mn^{ii+vi} = 54$.

The element manganese (L. corrupt. of *magnes*, from resemblance to the magnet, or from magnesia transposed, as both were confounded until 1740) is not of great importance to medicine; it occurs naturally in considerable quantities as black oxide, MnO_2 (pyrolusite, hausmannite, braunite), as sesquioxide, Mn_2O_3, as carbonate, $MnCO_3$; from this latter the metal may be obtained, by heating with charcoal—$MnCO_3 + 2C = Mn + 3CO$. It resembles iron very closely, but oxidizes easier, is harder and more brittle; sp. gr. 7.20; yields only two official salts.

Tests for Manganese Salts: 1. With ammonium sulphide get flesh-colored precipitate. 2. Na_2CO_3 or K_2CO_3 gives white precipitate insoluble in excess ammonium carbonate. 3. Borax bead is violet or amethyst. 4. Heated with $Na_2CO_3 + NaNO_3$ get bluish-green mass, forming with water a green solution which turns red with an acid.

Mangani Dioxidum. Manganese Dioxide, MnO_2.—(Syn., Mangani Oxidum Nigrum, Black Oxide of Manganese, Manganese, Peroxide or Deutoxide of Manganese, Pyrolusite, Oxidum Manganicum; Fr. Oxyde (Peroxyde) de Manganèse, Oxyde noir de Manganèse; Ger. Manganum Hyper-oxydatum, Braunstein, Mangan Super-oxyd.) This is the native crude manganese dioxide, containing 66 p. c. pure dioxide, MnO_2; it is heavy, grayish-black, gritty powder, odorless, tasteless, permanent, insoluble in water, alcohol; soluble in H_2SO_4 or HCl. *Assay:* 1 Gm. + 5 Cc. water + 4.22 Gm. $FeSO_4$ crystal + 5 Cc. HCl, gradually heated to boiling, then cooled + fresh potassium ferricyanide T. S. should give no blue color (presence of 66 p. c. pure MnO_2). *Impurities:* Organic substances, metallic sulphides, antimony sulphide. Dose, gr. 3–20 (.2–1.3 Gm.), ter die.

Properties and Uses.—Tonic, alterative, long usage may act as cumulative poison, causing staggering, paraplegia; good in syphilis, chlorosis, scurvy, skin diseases, itch, porrigo, stomach pains, pyrosis, gastralgia, simple ulcers. Acts solely as a coating to stomach, like bismuth salts. It is important: 1, for liberating chlorine from HCl or NaCl in making bleaching powder, mercuric chloride, etc. 2, for oxygen in laboratory work. 3, for furnishing manganese salts. 4, for black glazing to pottery. 5, for freeing glass from any iron coloration. 6, for mixing with iron to furnish the best steel.

Mangani Sulphas. Manganese Sulphate, $MnSO_4 + 4H_2O$.—(Syn., Manganous Sulphate, Manganesii Sulphas, Manganum Sulphuricum, Sulfas Manganosus; Fr. Sulfate (de Manganèse) manganeux; Ger. Schwefelsaures Manganoxydul, Manganosulfat.)

Manufacture: Heat to dull redness manganese dioxide and sulphuric acid, evaporate, crystallize. It is in colorless or pale-rose-colored, transparent, tetragonal prisms, or crystals, odorless, bitter, astringent taste, slightly efflorescent, soluble in 0.8 part water, insoluble in alcohol. *Test:* 1 Gm. ignited should lose not more than 0.323 Gm. in weight (distinction from that containing more water of crystallization). *Impurities:* Iron, copper, arsenic, zinc, salts of alkalies and magnesium. Should be kept in well-stoppered bottles. Dose, as a tonic, gr. 3–20 (.2–1.3 Gm.), in pill or solution.

Properties and Uses.—Tonic, cholagogue cathartic, styptic, large doses sedative to nerves and circulation, poisonous. Once considered a good substitute for iron, but now thought to have very little effect on chlorosis, anæmia or impoverished systems. An ointment acts as an irritant to enlarged glands, swollen joints, etc.

Incompatibles: Salts of lead, silver and mercury.

Synergists: Iron, zinc, copper.

CHROMIUM.

$Cr^{ii+vi} = 52.4.$

The element chromium (Gr. *χρῶμα*, color, + *ium; i. e.*, salts are colored) is not of much service in medicine, as it enters into only one official compound. Natively it mostly occurs as chrome iron ore or chromite, FeO,Cr_2O_3, having analogous composition to magnetic iron ore, FeO,Fe_2O_3; it forms two basic oxides, *chromous*, CrO, and *chromic*, Cr_2O_3, and an acid oxide, trioxide, CrO_3 (official), also have dioxide, CrO_2, and trichromic tetroxide, Cr_3O_4.

Tests for Chromium Salts: 1. $NaOH$—KOH—NH_4OH and NH_4SH will each precipitate green chromic hydroxide, $Cr_2(OH)_6$. 2. Soluble lead salts precipitate lead chromate (chrome yellow), $PbCrO_4$, insoluble in acetic acid, soluble in HCl, and NaOH.

Acidum Chromicum. Chromic Acid, $CrO_3 = CrO_3,H_2O$, or H_2CrO_4.—(Syn., Chromic Trioxide, Chromic Anhydride, Anhydrous Chromic Acid; Fr. Acide chromique; Ger. Acidum Chromicum, Chromsäure.)

Manufacture: Dissolve potassium dichromate in sulphuric acid, cool, crystallize—$K_2Cr_2O_7 + 2H_2SO_4 = 2CrO_3 + 2KHSO_4 + H_2O$. Occurs in small needle crystals, or rhombic prisms, crimson color, metallic lustre, odorless, destructive to animal and vegetable tissues, deliquescent, soluble in water (orange-red solution), yields oxygen easily with explosions. *Impurities:* Sulphuric acid, etc. Should be kept in glass-stoppered bottles, and handled out of contact with organic substances, such as cork, tannin, alcohol, glycerin, ether, sugar, etc., as dangerous accidents might occur. Dose, gr. $\frac{1}{8}$–$\frac{1}{4}$ (.008–.016 Gm.).

Properties and Uses.—Antiseptic, disinfectant, deodorant, escharotic, astringent; coagulates albumin. Used externally on growths in the mouth, larynx, pharynx, nasal passages (polypi), rhinitis, gangrene, scorbutic, syphilitic or gangrenous ulcers, tumors, bites of rabid animals, poisoned wounds, tineæ, sycosis, lupus, sweating or tender feet, conjunctivitis, uterine hemorrhage, leucorrhœa, gonorrhœa, incontinence of urine. The aqueous solution is mostly used, 5–10 p. c. or even varying up to the strong acid.

Poisoning: Give emetics, then magnesium oxide or carbonate, sodium bicarbonate or borate, demulcent drinks, stimulant enemas.

ZINCUM. ZINC.

$Zn^{ii} = 65.10$.

(Syn., Speltrum ; Fr. Speltre, Zinc ; Ger. Zink.)

The metal zinc (Ger. *zinn*, tin, with which it was formerly confounded) is official as thin sheets, irregular granulated pieces, moulded into thin pencils, or as fine powder. Occurs natively as sulphide (zinc-blende), ZnS, as carbonate (calamine), $ZnCO_3$, as silicate and as red oxide. Obtained pure by subliming carbonate or oxide mixed with charcoal; the vaporized metal distils into receivers, where it solidifies; it is bluish-white, showing crystalline fracture, tarnishes slowly with a film of oxide or carbonate, malleable, sp. gr. 6.9–7.2, soluble in dil. H_2SO_4 or HCl. It is a component of German silver, brass, and is the coating material of galvanized iron. *Impurities:* Iron, lead, copper, arsenic, cadmium, antimony, sulphur, phosphorus.

Tests for Zinc Salts: 1. NH_4SH precipitates white zinc sulphide, ZnS, which is the only white insoluble sulphide. 2. NaOH—KOH or NH_4OH precipitates white zinc hydroxide, $Zn(OH)_2$, soluble in excess. 3. K and Na carbonates and phosphates give white precipitates insoluble in excess. This is the only heavy metal having all compounds colorless; its salts are incompatible with vegetable astringents, alkalies, carbonates, lime water, sulphides, silver nitrate, lead acetate, milk; the soluble salts (sulphate, chloride) are poisonous, and should they not cause vomiting must give plenty warm water containing alkaline carbonates, or mustard, then egg-white and milk, tannin or some vegetable astringent, opium, heat to abdomen.

Zinci Bromidum. **Zinc Bromide,** $ZnBr_2$.—(Syn., Zincum Bromatum, Bromuretum Zincicum; Fr. Bromure de Zinc; Ger. Zinkbromid, Bromzink.)

Manufacture: Digest granulated zinc in hydrobromic acid, evaporate, dry—$Zn + 2HBr = ZnBr_2 + H_2$; or digest zinc, bromine, and water together, evaporate. It is a white granular powder, odorless, taste sharp, saline, metallic, very deliquescent, soluble in water, alcohol. *Assay:* Dissolve 0.3 Gm. in 10 Cc. water + 2 drops potassium chromate T. S.; this should require 26.7 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce permanent red color (corresponding to 99.95 p. c. pure salt). *Impurities:* Iron, aluminum, calcium, lead, copper, cadmium, arsenic, alkalies, magnesium, iodine. Dose, gr. 1–3 (.06–.2 Gm.).

PROPERTIES AND USES.—Antispasmodic, hypnotic, nervine, tonic, irritant poison, epilepsy.

Zinci Chloridum. **Zinc Chloride,** $ZnCl_2$.—(Syn., Butter of Zinc;

Fr. Chlorurétum Zincicum, Chlorure de Zinc; Ger. Zincum Chloratum, Chlorzink.)

Manufacture: Dissolve zinc in HCl by boiling—$2Zn + 4HCl = 2ZnCl_2 + H_4$; the solution also contains iron and lead chlorides, which are removed by adding HNO_3 to form ferric chloride, and then zinc carbonate to precipitate ferric hydroxide, filter, evaporate. Occurs in white granular powder, or porcelain-like masses, or moulded pencils, odorless, taste very caustic, astringent, metallic, very deliquescent, soluble in 0.3 part water, also in alcohol. *Assay:* 0.3 Gm. + 10 Cc. water + 2 drops potassium chromate T. S. should require 44.1 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce permanent red color (corresponding to 99.84 p. c. pure salt). *Impurities:* Lead, copper, cadmium, arsenic, iron, aluminum, calcium, alkalies, magnesium, oxychloride, sulphate. Should be kept in small glass-stoppered bottles. Dose, gr. $\frac{1}{10}$–$\frac{1}{2}$ (.006–.03 Gm.).

PREPARATION.—1. *Liquor Zinci Chloridi.* Solution of Zinc Chloride. (Syn., Burnett's Disinfecting Fluid; Fr. Chlorure de Zinc liquide, Soluté de Burnett; Ger. Flüssiges Chlorzink, Chlorzink-Lösung.) An aqueous solution of zinc chloride, $ZnCl_2$, containing 50 p. c. by weight of the salt.

Manufacture: To zinc, granulated, 24 Gm., add distilled water 15 Cc., to this gradually add hydrochloric acid 84 Gm., digest, to solution add nitric acid 1.2 Gm., evaporate to dryness (to remove nitrous compounds), dissolve in distilled water, q. s. 100 Gm., add precipitated zinc carbonate 1.2 Gm., agitate, clear by subsidence. The HNO_3 oxidizes iron into ferric chloride, while zinc carbonate precipitates this as ferric oxide. It is a clear, colorless liquid, odorless, astringent, sweet acrid taste, sp. gr. 1.535. Dose, ♏ $\frac{1}{4}$–1 (.016–.06 Cc.), seldom used internally.

PROPERTIES AND USES.—Alterative, antispasmodic, astringent, escharotic, caustic, antiseptic, disinfectant. Internally, in scrofula, epilepsy, chorea, nervous troubles. Externally, in cancerous affections, tumors, cancers, aneurism, malignant and morbid growths, lupus, ulcers of uterus, etc., leucorrhœa, gonorrhœa, hemorrhagic endometritis, cystic tumors, nasal polypi, abscesses, scrofulous glands; to fill carious teeth, vascular and thickened conjunctiva. The liquor is the weaker form used chiefly to deodorize and disinfect sewers, sinks, water-closets, hospitals, dissecting rooms, etc., for embalming, to preserve anatomical subjects. When diluted (1–18) used as injection in gonorrhœa, leucorrhœa, etc., and as wash for ulcers, abscesses, to destroy putrid odor, etc. The salt itself sometimes applied for caustic purposes in pasty form, diluted 2–3–4–5 times with wheat flour, rye flour, or gluten.

Poisoning: Symptoms similar to violent corrosive irritant poison; paralysis, cold surface, dilated pupils, coma. Give alkalies, alkali carbonates, emetics, soap, milk, albumin, anodynes, stimulants, tannin.

Zinci Iodidum. Zinc Iodide, ZnI_2.—(Syn., Ioduretum Zincicum; Fr. Iodure de Zinc; Ger. Zinkjodid, Jodzink.)

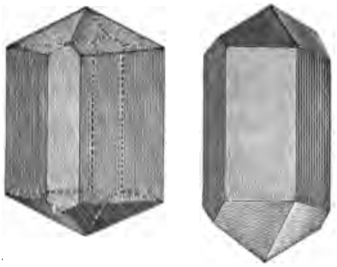
Manufacture: Dissolve zinc oxide, carbonate, or metal, in hydriodic acid, or digest metal with iodine and water, evaporate to dryness—(1) $Zn + 2HI = ZnI_2 + H_2$. (2) $Zn + I_2 + H_2O = ZnI_2 + H_2O$. It is a white, granular powder, odorless, sharp, saline, metallic taste, very deliquescent, absorbing oxygen and turning brown from liberated iodine, soluble in water, alcohol. *Assay:* Dissolve 0.5 Gm. in 10 Cc. water + 2 drops potassium chromate T. S.; this should require 31.0–31.4 Cc. $\frac{N}{10}$ silver nitrate V. S. to produce permanent red color (31.0 corresponding to 98.62 p. c., 31.4 to 99.9 p. c. pure zinc iodide). *Impurities:* Iron, aluminum, calcium, lead, copper, cadmium, arsenic, alkalies, magnesium, sulphate. Should be kept in small, glass-stoppered bottles. Dose, gr. 1–3 (.06–.2 Gm.), in solution or syrup.

Properties and Uses.—Alterative, astringent, caustic, chorea, scrofula, hysteria. Externally, similar to chloride in enlarged tonsils, tumors, gonorrhœa, leucorrhœa; applied as ointment 10 p. c., or solution 2–5 p. c., or injection $\frac{1}{5}$–$\frac{1}{2}$ p. c.

Zinci Phosphidum. Zinc Phosphide, Zn_3P_2.—(Syn., Phosphuret of Zinc; Fr. Phosphoretum Zincicum, Phosphure de Zinc; Ger. Phosphorzink.)

Manufacture: Fuse zinc and phosphorus, or pass phosphorus vapors in a current of dry hydrogen over fused zinc—$3Zn + 2P + \text{heat} = Zn_3P_2$. It contains 25 p. c. phosphorus, being a gritty, dark-gray powder, or in crystalline fragments of dark metallic lustre, faint odor, phosphorus taste; emits phosphorus vapors on exposure, insoluble in water, alcohol, soluble in (decomposed by) dil. HCl or H_2SO_4 with evolution of hydrogen phosphide. *Impurities:* Iron, copper, lead, arsenic, cadmium. Should be kept in small, glass-stoppered vials. Dose, gr. $\frac{1}{16}$–$\frac{1}{8}$ (.004–.02 Gm.), in pill, powder, or syrup on empty stomach.

Fig. 431.



Zinc sulphate crystals.

Properties and Uses.—Nervous stimulant, aphrodisiac, similar to phosphorus in defective nutrition of brain and spine, locomotor ataxia, general paralysis, neuralgia, spinal irritation, hysteria, cerebral disorders, chlorosis, anæmia, amenorrhœa, dysmenorrhœa, mercurial tremor.

Zinci Sulphas. Zinc Sulphate, $ZnSO_4 + 7H_2O$.—(Syn., Vitriolum Album, White Vitriol; Fr. Sulfas Zincicus, Sulfate de Zinc, Vitriol blanc, Couperose blanche; Ger. Zincum Sulfuricum, Zinksulfat, Schwefelsaures Zinkoxyd, Weisser Vitriol, Galitzenstein.) This is the most important zinc salt.

Manufacture: Dissolve zinc in diluted sulphuric acid, remove iron and lead chlorides with HNO_3 and zinc carbonate—$2Zn + 2H_2SO_4 + H_2O = 2ZnSO_4 + H_4 + H_2O$. It is in colorless, transparent rhombic crystals, odorless, taste astringent, metallic, efflorescent in dry air, soluble in 0.6 part water, 3 glycerin, insoluble in alcohol. *Impurities:*

Iron, aluminum, calcium, arsenic, cadmium, copper, lead, alkalies, magnesium, chloride, free acid. Should be kept in well-stoppered bottles. Dose, tonic, astringent, gr. 1–3 (.06–.2 Gm.), in pill, after meals; emetic, gr. 10–30 (.6–2 Gm.), in tepid water.

PROPERTIES AND USES.—Tonic, astringent, emetic, gastric catarrh, night-sweats, epilepsy, chorea, croup, diphtheria, dysentery, typhoid fever, atonic dyspepsia, heart palpitation, spasmodic asthma, whooping-cough. Externally, aphthæ, conjunctivitis, gonorrhœa, ophthalmia, throat and larynx troubles, hemorrhages, nasal polypi, ulcers, tumors, lupus, eczema, itching, to remove urethral caruncles, condylomata, warty excrescence. Caustic paste (℥j; 30 Gm. to glycerin ʒj; 4 Cc.), caustic ointment (℥j; 30 Gm. to lard ʒij; 8 Gm.), used as escharotic; injection, collyrium, and gargle ($\frac{1}{5}$–$\frac{1}{2}$ p. c.) are often useful.

Zinci Valerianas. Zinc Valerianate, $Zn(C_5H_9O_2)_2 + 2H_2O$.—(Syn., Valerianas (Valeras) Zincicus; Fr. Valérianate (Valérate) de Zinc; Ger. Zincum Valerianicum, Baldriansaures Zinkoxyd.)

Manufacture: Add together hot solutions of zinc sulphate and sodium valerianate, evaporate, crystallize—$ZnSO_4 + 2NaC_5H_9O_2 = Zn(C_5H_9O_2)_2 + Na_2SO_4$. It is in white pearly scales, odor of valerianic acid; sweetish, astringent, metallic taste, on exposure slowly loses valerianic acid, soluble in 100 parts water, 40 alcohol. *Impurities:* Iron, lead, copper, cadmium, arsenic, alkalies, magnesium, acetate, butyrate. Should be kept in small, well-stoppered bottles. Dose, gr. 1–3 (.06–.2 Gm.), in pill, mucilage, syrup.

PROPERTIES AND USES.—Antispasmodic, nervine, diabetes insipidus, neuralgia, epilepsy, chlorosis, nervous headache, vertigo, whooping-cough, convulsions, hysteria, chorea, cholera.

Zinci Carbonas Præcipitatus. Precipitated Zinc Carbonate, $2ZnCO_3,3Zn(OH)_2$ (?)—(Syn., Zincum Carbonicum, Carbonas Zincicus; Br. Zinci Carbonas; Fr. Hydrocarbonas Zincicus, Zincum Sous-Carbonate, Hydrocarbonate de Zinc; Ger. Zinkcarbonat, Kohlensaures Zinkoxyd.)

Manufacture: Boil together solutions of zinc sulphate and sodium carbonate, filter, wash, dry—$5(ZnSO_4 + 7H_2O) + 5(Na_2CO_3 + 10H_2O) = 2ZnCO_3,3Zn(OH)_2 + 3CO_2 + 5Na_2SO_4 + 82H_2O$. It is an impalpable white powder, of variable composition, odorless, tasteless, permanent, insoluble in water, alcohol; soluble in diluted acids with effervescence. *Impurities:* Iron, aluminum, calcium, lead, copper, arsenic, cadmium, alkalies.

PROPERTIES AND USES.—Astringent, protective, absorbent, chiefly externally for healing blisters, superficial sores, intertrigo, abrasions; in ointment, which is now substituted for the once popular Turner's cerate, made from impure native carbonate—calamine; may simply dust the powder on inflamed surfaces.

Allied Salt:

1. *Zinci Carbonas Impurus, Lapis Calaminaris. Calamine.*—Official, 1830–1860.

Zinci Oxidum. Zinc Oxide, ZnO.—(Syn., Flores Zinci, Zinc-White, Nihil Album, Lana Philosophica; Fr. Oxydum Zincicum, Oxyde de Zinc; Ger. Zincum Oxydatum (Purum), Zinkoxyd, Philosophenwolle Zinkblumen.)

Manufacture: Heat zinc carbonate to redness in a crucible—$2ZnCO_3,3Zn(OH)_2 + \text{heat} = 5ZnO + 2CO_2 + 3H_2O$. It is an amorphous white powder, odorless, tasteless, gradually absorbs CO_2 from air, insoluble in water, alcohol, soluble in dilute acids, ammonia water and ammonium carbonate T. S. without effervescence. *Impurities:* Iron, lead, copper, cadmium, aluminum, calcium, arsenic, alkalies, magnesium, alkaline carbonate, chloride sulphate, silicate. Should be kept in well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.), in pill ter die.

PREPARATION.—1. *Unguentum Zinci Oxidi.* Ointment of Zinc Oxide. (Syn., Ointment of Zinc; Br. Unguentum Zinci; Fr. Unguentum de Nihilo Albo, Pommade d'Oxyde de Zinc, Cérat épulotique; Ger. Unguentum Zinci, Zinksalbe.)

Manufacture: Sift zinc oxide 20 Gm. upon melted benzoinated lard 80 Gm., stir until cool.

PROPERTIES AND USES.—Antispasmodic, astringent, chorea, epilepsy, whooping-cough, gastric and intestinal catarrhs, hysteria, spasmodic asthma, delirium tremens, colliquative sweats, diarrhœa, dysentery, diabetes insipidus. Externally, burns, scalds, fissures of nipples, anus, chancroids, intertrigo, ulcers, leucorrhœa, skin eruptions, erysipelas, chronic ophthalmia, cosmetic, paint. Ointment is good form of application, having superseded the old Unguentum Tutiæ (tutty) made from impure zinc oxide—tutty (1 to 5).

Allied Salt:

1. *Zinci Oxidum Impurum. Tutty, Tuttia.*—Official, 1830–1840.

Zinci Acetas. Zinc Acetate, $Zn(C_2H_3O_2)_2 + 2H_2O$.—(Syn., Fr. Acetas Zincicus, Acétate de Zinc; Ger. Zincum Aceticum, Zinkacetat, Essigsaures Zinkoxyd.)

Manufacture: Dissolve zinc oxide (or carbonate) in acetic acid and water, boil, crystallize—$ZnO + 2HC_2H_3O_2 = Zn(C_2H_3O_2)_2 + H_2O$. It is in soft, white, six-sided monoclinic plates, pearly lustre, faint acetous odor, astringent metallic taste, gradually effloresces, soluble in 2.7 parts water, 36 alcohol. *Impurities:* Iron, lead, copper, cadmium, arsenic, aluminum, alkalies, alkaline earths, sulphate, chloride. Should be kept in well-stoppered bottles.

PROPERTIES AND USES.—Astringent, irritant, emetic; erysipelas, delirium, diarrhœa in typhoid, mostly externally in conjunctivitis, gonorrhœa ($\frac{1}{5}$–$\frac{1}{2}$ p. c.). The injection is usually prepared by adding zinc sulphate and lead acetate, each gr. 12 (.8 Gm.) to water ℥viij (240 Cc.), which by double decomposition gives zinc acetate in solution and lead sulphate precipitated, this latter being most excellent for sheathing inflamed parts.

CADMIUM.

$Cd^{II} = 111.5$.

(Official, 1860–1880.)

The element cadmium (Gr. *καδμεία*, calamine, $ZnCO_3$—the two carbonates resemble and often occur together) is found sparingly in nature, associated with zinc ores, especially calamine—zinc carbonate. It is a white metal resembling tin, but heavier and more tenacious, crackles when bent, sp. gr. 8.7. The air has but little effect upon it, but when heated combines with one atom of oxygen, producing orange-red oxide, CdO; it combines with chlorine, bromine, iodine, and sulphur.

Tests for Cadmium Salts: 1. With H_2S, or ammonium sulphide get yellow-orange sulphide. 2. $NaOH$ or KOH produces white precipitate, insoluble in excess, while that of ammonia water is soluble in excess. 3. Sodium or potassium carbonates precipitate white cadmium carbonate. The salts of cadmium are but little used in medicine, the sulphide to a considerable extent as a pigment.

PLUMBUM. LEAD.

$Pb^{II} = 206.5$.

Official, 1820–1830. (Syn., Fr. Plomb; Ger. Blei.)

The element lead (A.S. *lead*, heavy weight, plummet, L. *plumbum*) is obtained mostly from native sulphide (galena) PbS, by roasting in a reverberatory furnace: (1) $PbS + O_3 = PbO + SO_2$. (2) $PbS + O_4 = PbSO_4$. (3) $PbS + 2PbO = 3Pb + SO_2$. (4) $PbS + PbSO_4 = 2Pb + 2SO_2$, or heat sulphide with iron—$PbS + Fe = FeS + Pb$.

It is a soft, fusible, heavy metal, sp. gr. 11.45, entering into the alloys of solder, shot, Britannia metal, type metal, etc.

Tests for Lead Salts: 1. H_2S, or NH_4SH precipitates insoluble black sulphide. 2. H_2SO_4, or soluble sulphate, precipitates white lead sulphate, insoluble in HNO_3. 3. Alkaline carbonates precipitate white basic lead carbonate insoluble in excess.

Plumbi Carbonas. Lead Carbonate, $(PbCO_3)_2,Pb(OH)_2$.—(Syn., White Lead, Flake White, Plumbum (Carbonicum) Hydrico-carbonicum, Carbonas Plumbicus; Fr. Carbonate (Blanc) de Plomb, Céruse, Blanc de Céruse; Ger. Cerussa, Bleiweiss, Blei Carbonat.)

Manufacture: Lead sheets are exposed to air, acetic acid vapors, and carbon dioxide—$6Pb + 6HC_2H_3O_2 + O_6 + 2CO_2 = (PbCO_3)_2,Pb(OH)_2 + 2H_2O + 3Pb(C_2H_3O_2)_2$, or double decompose lead nitrate with sodium carbonate. It is a heavy white opaque powder, or pulverulent mass, odorless, tasteless, permanent, insoluble in water, alcohol, soluble in acetic acid or dil. HNO_3 with effervescence. *Assay:* 1 Gm. ignited should leave residue of lead oxide weighing .85 Gm. *Impurities:* Alkalies, alkaline earths, zinc. Should be kept in well-closed vessels.

PREPARATION.—1. *Unguentum Plumbi Carbonatis.* Ointment of Lead Carbonate. (Syn., Fr. Pommade de Carbonate de Plomb, Pomatum cum Carbonate Plumbico, Onguent blanc de Rhazes; Ger. Unguentum Cerussæ (Album Simplex), Bleiweissalbe.)

Manufacture: Rub lead carbonate 10 Gm. with benzoinated lard 90 Gm., gradually added, until thoroughly mixed.

PROPERTIES AND USES.—Externally a protective to irritated surfaces, also to constringe, erysipelas, erythema, intertrigo, ulcers, excoriated surfaces, eczema, burns, carbuncles, as paint cosmetic. Often produces chronic poisoning when applied to abraded parts, applied in fine powder, ointment.

Plumbi Oxidum. Lead Oxide, PbO.—(Syn., Litharge, Oxide of Lead, Flowers of Lead, Semi-vitrified Lead Oxide, Plumbum Oxydatum, Plumbi Oxidum Semi-vitreum; Fr. Oxide de Plomb fondu, Protoxide de Plomb; Ger. Lithargyrum, Bleiglätte, Bleioxyd.)

Manufacture: Heat metallic lead to whiteness in the air, the oxygen of which combines, forming lead oxide, while any silver present remains unchanged, if only heated to fusion get yellow amorphous *massicot*, a less oxidized form. It is a heavy, reddish-yellow powder, or in minute scales, odorless, tasteless, on exposure absorbs moisture and CO_2, insoluble in alcohol, nearly so in water, soluble in acetic acid, dil. HNO_3 or fixed alkalies; heated with charcoal yields the metal. *Impurities:* Copper, iron, carbonate, silicate, barium sulphate. Should be kept in well-closed vessels.

PREPARATIONS.—1. *Emplastrum Plumbi.* Lead Plaster (Diachylon Plaster). (Syn., Litharge Plaster, Emplastrum Diachylon Simplex, Emplastrum Album Coctum; Fr. Emplastrum Simplex, Emplâtre simple (de Plomb—de Litharge); Ger. Emplastrum Lithargyri (Simplex), Emplastrum Cerusæ, Bleipflaster.)

Manufacture: Lead oxide 3,200 Gm., olive oil 6,000 Gm., water 1,000 Cc.+; boil together, constantly stirring until mass is whitish and homogeneous, occasionally adding water to preserve volume, knead to remove glycerin, divide into suitable size rolls—$3PbO + 3H_2O + 2(C_3H_53C_{18}H_{33}O_2) = \underset{\text{Lead oleate.}}{3(Pb2C_{18}H_{33}O_2)} + \underset{\text{Glycerin.}}{2(C_3H_53OH)}$.

Preps.: 1. *Unguentum Diachylon.* Diachylon Ointment. (Syn., Unguentum Plumbi Hebræ, Hebra's Lead Ointment; Fr. Onguent (Pommade de) Diachylon; Ger. Diachylon-salbe.)

Manufacture: Melt together lead plaster 50 Gm., olive oil 49 Gm., partly cool, add oil of lavender flowers 1 Cc., stir until cold.

2. *Emplastrum Ammoniaci cum Hydrargyro.* Use externally.
3. *Emplastrum Ferri.* Use externally.
4. *Emplastrum Hydrargyri.* Use externally.
5. *Emplastrum Opii.* Use externally.
6. *Emplastrum Resinæ.* Use externally.
7. *Emplastrum Saponis.* Use externally.

2. *Liquor Plumbi Subacetatis,* 10 p. c. Use externally.

Properties and Uses.—Chiefly externally and in combination, for burns, abraded surfaces, to allay inflammations, also enters into paints, flint glass, glazing of pottery, etc., with KOH as caustic in condylomata, warts of glans penis and vagina, producing a superficial black slough. The emplastrum to prevent bed-sores, abrasions; if surface be large, plaster is usually substituted to avoid poisoning.

Allied Salt:

1. *Plumbi Oxidum Rubrum.* *Red Lead,* $Pb_3O_4 = 2PbO,PbO_2$.—Official, 1840–1850. Obtained by heating massicot to 450° C. (840° F.), which gradually combines with more oxygen, forming red lead. It is a bright-reddish-orange, granular, crystalline powder, becoming redder by more heat, then purple, black. At red heat gives up oxygen, going into litharge; sp. gr. 8.7–9.1, contains 90.66 p. c. lead, 9.34 p. c. oxygen.

Plumbi Acetas. Lead Acetate, $Pb(C_2H_3O_2)_2 + 3H_2O$.—(Syn., Sugar of Lead, Acetas Plumbicus, Saccharum Saturni, Cerussa Acetata; Fr. Acétate de Plomb, Sucre de Plomb, Sel de Saturne; Ger. Plumbum Aceticum, Blei Acetat, Essigsaures Bleioxyd, Bleizucker.)

Manufacture: Act upon lead oxide with acetic acid diluted with water, evaporate, crystallize—$PbO + 2HC_2H_3O_2 + \text{heat} = Pb(C_2H_3O_2)_2 + H_2O$, or expose lead plates to the combined action of air and vinegar. It occurs in colorless, shining, transparent, monoclinic prisms, or plates, or heavy crystalline masses, acetous odor, sweet, astringent, metallic taste, efflorescent, absorbs CO_2, soluble in 2.3 parts water, 21 alcohol; when heated loses water of crystallization (14.25 p. c.) and acetic acid, going into carbon dioxide, acetone, metallic lead mixed with oxide and carbonate. *Impurities:* Iron, copper, alkalies, zinc, carbonate. Should be kept in well-stoppered bottles. Dose, gr. ½–4 (.03–.26 Gm.), usually with opium.

Fig. 432.

Lead acetate crystal.

Preparations.—1. *Liquor Plumbi Subacetatis.* Solution of Lead Subacetate. (Syn., Goulard's Extract, Acetum Plumbicum (Saturni), Plumbum Hydrico-Aceticum Solutum; Fr. Sous Acétate de Plomb liquide, Extrait de Saturne (de Goulard), Vinaigre de Plomb (de Saturne); Ger. Liquor Plumbi Subacetici, Bleiessig.)

Manufacture: Dissolve lead acetate 17 Gm. in boiling distilled water 80 Gm., then add fine lead oxide 10 Gm., boil half an hour, cool, add distilled water q. s. 100 Gm., filter. It is a clear, colorless, aqueous liquid containing in solution 25 p. c. basic lead acetate or lead subacetate, ($Pb_2O(C_2H_3O_2)_2$ (?)), odorless, sweet, astringent taste, alkaline reaction, absorbs CO_2, causing white precipitate, sp. gr. 1.195. *Test:* When added to acacia solution get dense, white precipitate (distinction from normal lead acetate). *Assay:* 13.67 Gm. of liquor + 50 Cc. water require to precipitate the lead 25 Cc. normal sulphuric acid

V. S. (each Cc. of V. S. corresponding to 1 p. c. lead subacetate), methyl-orange indicator. Should be kept in well-stoppered bottles.

Preps.: 1. *Liquor Plumbi Subacetatis Dilutus.* Diluted Solution of Lead Subacetate. Lead Water. (Syn., Aqua Plumbica (Saturnina); Fr. Eau de Saturne, Eau blanche; Ger. Aqua Plumbi, Bleiwasser, Kühlwasser.)

Manufacture: Mix solution of lead subacetate 3 Cc. with distilled water, previously boiled and cooled, q. s. 100 Cc. Should be kept in well-stoppered bottles.

2. *Ceratum Plumbi Subacetatis.* Cerate of Lead Subacetate, Goulard's Cerate. (Syn., Ointment of Glycerin of Lead Subacetate; Br. Unguentum Glycerini Plumbi Subacetatis; Fr. Ceratum cum Subacetate Plumbico, Cérat Saturné—de Saturné—de Goulard; Ger. Unguentum Plumbi, Bleisalbe, Bleicerat.)

Manufacture: Mix solution of lead subacetate 20 Gm., with camphor cerate 80 Gm. Should always be freshly prepared.

PROPERTIES AND USES.—Astringent, sedative, large doses, irritant poison, diarrhœa, dysentery, internal hemorrhage, aneurism, tympanites, epilepsy, neuralgia, chorea, hysteria, bronchitis, whooping-cough, sweats. Externally, contusions, excoriations, fractures, sprains, conjunctivitis, gonorrhœa, leucorrhœa, chronic eczema, eye troubles (wash or drops, $\frac{1}{5}$–$\frac{1}{2}$ p. c. in distilled water). Cerate—for excoriations, burns, scalds, chilblains, skin eruptions, acute inflammations.

Plumbi Nitras. Lead Nitrate, $Pb(NO_3)_2$.—(Syn., Plumbum Nitricum, Nitras (Azotas) Plumbicus; Fr. Azotate (Nitrate) de Plomb; Ger. Salpetersaures Bleioxyd, Bleisalpeter.)

Manufacture: Dissolve lead (or oxide, or carbonate) in warm diluted nitric acid—$PbO + 2HNO_3 = Pb(NO_3)_2 + H_2O$. It is in colorless, transparent, or opaque, octahedral crystals, odorless, sweetish, astringent, metallic taste, permanent, soluble in 2 parts water, insoluble in alcohol, chars into lead oxide. *Impurities:* Iron, copper, zinc, salts of alkalies. Dose, gr. $\frac{1}{2}$–4 (.03–.26 Gm.).

PROPERTIES AND USES.—Discutient, deodorizer. Mostly externally to correct fetor of gangrenous sores, offensive discharges from ear, nostril, rectum, vagina, ozæna, sore nipples, chapped hands, cracked lips, leucorrhœa, gonorrhœa, ulcers, impetigo, epithelioma. Ledoyen's disinfecting fluid (12 p. c.) is a good deodorant.

Plumbi Iodidum. Lead Iodide, PbI_2.—(Syn., Ioduretum Plumbicum; Fr. Iodure de Plomb; Ger. Plumbum Iodatum, Jodblei.)

Manufacture: Mix equal quantities (120 Gm.) of lead nitrate and potassium iodide, each dissolved separately in sufficient water (500 Cc.), filter, wash, dry precipitate—$Pb(NO_3)_2 + 2KI = PbI_2 + 2KNO_3$. It is a heavy, bright-yellow powder, odorless, tasteless, permanent, soluble in alkaline solutions, 2,000 parts water, 200 boiling water. *Impurities:* Nitrate, acetate, chromate, soluble salts. Should be kept dark, in well-stoppered bottles. Dose, gr. $\frac{1}{2}$–4 (.03–.26 Gm.), ter die in pill.

Preparation.—1. *Unguentum Plumbi Iodidi.* Ointment of Lead Iodide. (Syn., Fr. Pomatum cum Iodureto Plumbico, Pommade d'Iodure de Plomb; Ger. Jodbleisalbe.)

Manufacture: Rub lead iodide 10 Gm. with benzoinated lard 90 Gm. gradually added, until thoroughly mixed.

Properties and Uses.—Resolvent, tuberculous diseases, scrofulous tumors, ulcers, indolent swellings, malarial enlargement of spleen; ointment, best form externally.

Poisoning: From any of the lead salts, when acute have burning, sweetish taste, thirst, vomiting (whitish fluid, due to lead chloride), abdominal colic, constipation, feces black (lead sulphide), cold skin, collapse, giddiness, coma, convulsions. Give magnesium or sodium sulphate, then vomit, follow with purgative enema, demulcent drinks, egg-white, milk, stimulants, opium; for lead colic hot fomentation, opiates, evacuants; for chronic lead poisoning (constipation and dark-blue line at base of the teeth, wrist-drop) give iodides to saturation (Na, K, Ca), sulphurous baths, calomel, sulphuric acid, lemonade, friction to muscles, electricity, strychnine.

CUPRUM. COPPER.

$Cu^{ii} = 63.2.$

(Official, 1870–1880.)

The element copper (Gr. Κύπρος, Cyprus, Mediterranean island, whence the Romans got their best copper; L. *cuper*, *cuprum*, contr. of Cyprium) enters into alloys—brass, German silver, bell metal, bronze, gun metal, gold, silver, and occurs in nature as metal, sulphide, oxide, sulphate, carbonate, phosphate, and arsenate. The most common ore—copper pyrites, Cu_2S,Fe_2S_3, has brass or gold lustre, but copper glance, Cu_2S (dark-gray), and malachite, $Cu_2CO_3,Cu(OH)_2$ (beautiful green), yield considerable metal. It is red in color, malleable, sp. gr. 8.92–8.95, good conductor of heat and electricity, becoming coated by exposure with green film of subcarbonate; forms two oxides: 1. Red—*cuprous*, Cu_2O; 2. Black—*cupric*, CuO.

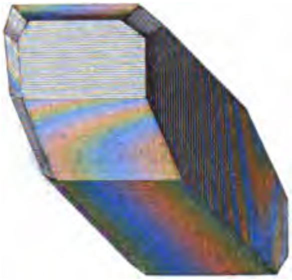
Tests for Copper Salts: 1. H_2S or NH_4SH precipitates black cupric sulphide. 2. KOH or $NaOH$ precipitates blue cupric hydroxide, $Cu(OH)_2$, which by boiling goes into dark-brown cupric oxide, CuO; but with NH_4OH get only dark-blue solution—an ammonio-copper compound. 3. Potassium ferrocyanide precipitates reddish-brown cupric ferrocyanide, $Cu_2Fe(CN)_6$. 4. Polished iron, steel, or zinc immersed in an acidified copper solution becomes coated with metallic copper.

Cupri Sulphas. Copper Sulphate—Cupric Sulphate, $CuSO_4 + 5H_2O$.—(Syn., Blue Vitriol, Blue Stone, Roman Vitriol, Cuprum Vitriolatum, Sulfas Cupricus; Fr. Sulfate de Cuivre, Vitriol bleu, Couperouse bleu; Ger. Cuprum Sulfuricum, Kupfer-(vitriol)sulfat, Blauer (vitriol) Galitzenstein, Schwefelsaures Kupfer.)

Manufacture: Heat copper with sulphuric acid, shake with hot water, evaporate, crystallize—$Cu + 2H_2SO_4 = CuSO_4 + 2H_2O + SO_2$, or may heat copper pyrites. It is in large transparent deep-blue, triclinic crystals, odorless, nauseous metallic taste, efflorescent, soluble in 2.6 parts water, nearly insoluble in alcohol. *Impurities:* Iron, aluminum, lead, zinc, arsenic, alkaline earths. Dose, tonic, astringent, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.008–.03 Gm.) in pill; emetic, gr. 2–10 (.13–.6 Gm.), mixed with sugar or in solution, repeated in fifteen minutes if necessary.

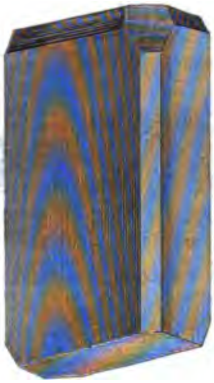
PROPERTIES AND USES.—Astringent, tonic, irritant, escharotic, emetic, stimulant. Once used for epilepsy, and now for chronic ulcerated diarrhœa, dysentery, cholera, croup, malignant sore throat. Externally, foul ulcers, caustic for warts, fungoids, callous, bleeding surfaces, chancres, ulcerated stomatitis, gangrene of pharynx, mercurial sore mouth, conjunctivitis, acne, eczema. Convenient forms for application are the crystal, cuprum aluminatum (*lapis divinus, pierre divine, pierre ophthalmique*, in pencils or stick), and the wash ($\frac{1}{2}$–1–2 p. c.). Used also as a test for diabetic sugar, and in making many green pigments, as Scheele's green (arsenite), Paris green (aceto-arsenite), Bremen green (hydroxide) and others.

FIG. 433.



Copper sulphate crystal.

FIG. 434.



Copper acetate crystal.

Allied Salts:

1. *Cupri Acetas. Copper Acetate*, $Cu(C_2H_3O_2)_2.H_2O$.—Official, 1880–1890. Obtained by dissolving verdigris in acetic acid, or precipitate solution of lead acetate with copper sulphate. It is in deep-bluish-green rhombic prismatic crystals, efflorescent, odorless, nauseating metallic taste, soluble in 15 parts water, 135 alcohol. *Impurities:* Alkalies, alkaline earths, iron, lead, zinc, chloride, sulphate, calcium. Dose, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.008–.03 Gm.). Solutions should be $\frac{1}{5}$–1 p. c.

PROPERTIES AND USES.—Skin diseases, scrofula, intermittents, epilepsy, in collyria, aphthous ulcers, gonorrhœa.

2. *Cupri Subacetas. Copper Subacetate. Verdigris.*—Official, 1830–1880, $Cu_2O(C_2H_3O_2)_2$. Obtained thus: grape husks are allowed to undergo acetic fermentation, and are then stratified in earthen vessels with sheets of copper, where they are allowed to remain four to

six weeks, whereupon the sheets after drying and exposing several weeks will be found coated with verdigris; this is scraped off and the plates replaced for a second action, etc.; verdigris is then dried in the sun, and occurs in masses, bluish-green color, composed of many silky crystals, coppery taste, insoluble in alcohol, soluble in ammonia, HCl, dil. H_2SO_4, partially in water.

PROPERTIES AND USES.—Stimulant, escharotic; externally, indolent ulcers, tuberculated skin troubles, warts, syphilitic chancres. Not used internally.

Poisoning: Large doses gastro-intestinal irritant; long continued small doses cause bronchial catarrh, colic, diarrhœa, salivation, anæmia, wasting, jaundice, fatty liver, nervousness. Give egg-white to form insoluble compound, then emetics at once, also reduced iron, weak solution potassium ferrocyanide (chemical antidote), magnesia, tannin, opium, again empty stomach and saturate system with potassium iodide.

Incompatibles: Alkalies, their carbonates, sulphides, mineral salts (except sulphates), lime water, iodides, vegetable astringents.

BISMUTHUM. BISMUTH.

$Bi^{iii} = 208.9.$

(Official, 1830–1880.)

The element bismuth (Ger. *wismuth*, fr. *wiesematte*, a beautiful shadow, from its variegated tints when fresh) is mostly found in metallic state as small veins in rocks, also occurs as sulphide. It is obtained from the ore by simply melting it away from its earthy matter; it is brittle, crystalline, brilliant, with silver color and pinkish tinge, forms several alloys and many medicinal salts, some being official.

Tests for Bismuth Salts.—1. H_2S or NH_4SH precipitates black bismuth sulphide, Bi_2S_3, insoluble in excess. 2. Acid bismuth solutions poured into water form white precipitate of subsalts or bismuthyl salts. 3. Ammonium or sodium hydroxide or carbonate precipitates white bismuth hydroxide, $Bi(OH)_3$, or bismuthyl carbonate.

Bismuthi Subnitras. Bismuth Subnitrate, $BiONO_3H_2O$ (?).—(Syn., White Bismuth, Bismuthum Hydrico-nitricum, Magisterium Bismuthi, Subazotas (Subnitras) Bismuthicus, Bismuthyl Nitrate; Fr. Sousazotate (sous-nitrate) de Bismuth; Ger. Bismuthum Subnitricum, Basisches Wismuthnitrate (Salpetersaures Wismuthoxyd), Wismuthsubnitrat.)

Manufacture: Dissolve purified bismuth in nitric acid, evaporate, pour into water, stir, wash and dry precipitate—(1) $Bi + 4HNO_3 = Bi(NO_3)_3 + NO + 2H_2O$. (2) $5Bi(NO_3)_3 + 8H_2O = 4BiONO_3,H_2O + Bi(NO_3)_3 + 8HNO_3$. It is a heavy white powder of varying composition, odorless, nearly tasteless, permanent, insoluble in water, alcohol, soluble in HNO_3 or HCl. *Impurities:* Arsenic, alkalies, alkaline earths. Dose, gr. 5–30 (.3–2 Gm.), ter die, in water on empty stomach.

PROPERTIES AND USES.—Sedative, astringent, almost insoluble in the system, acts mechanically by coating the stomach's mucous membrane with a protective film, thus preventing any irritation from visceral contents. Used in gastralgia, subacute gastritis, pyrosis, stomachic disease, irritated intestinal mucous membrane, diarrhœa, dysentery, cholera infantum ; injection in gonorrhœa, leucorrhœa, dysentery, rectal irritation, coryza ; the powder locally in burns, variola, eczema, fissures, chapped nipples, lips, hands, intertrigo, ozæna, fetid feet, whooping-cough ; also a test for diabetic sugar.

Allied Salt:

1. *Bismuthi Oxidum, Bismuth Oxide,* Bi_2O_3.—Obtained by boiling five minutes bismuth subnitrate in solution of soda, filter, dry precipitate—$2(BiNO_4,H_2O) + 2NaOH = 2Bi(OH)_3$ (or $Bi_2O_3,3H_2O + 2NaNO_3$). Occurs as a dull lemon-yellow powder, resembling the subnitrate in medicinal properties, doses and uses.

Bismuthi Citras. Bismuth Citrate, $BiC_6H_5O_7$.—(Syn., Bismuthum Citricum, Citras Bismuthicus ; Fr. Citrate de Bismuth ; Ger. Wismuthcitrat, Citronensaures Wismuthoxyd.)

Manufacture: Boil bismuth subnitrate 100 Gm., citric acid 70 Gm. with distilled water 400 Cc., now add distilled water 5,000 Cc., wash precipitate, dry—$(BiONO_3 + H_2O) + (H_3C_6H_5O_7 + H_2O) = BiC_6H_5O_7 + HNO_3 + 3H_2O$. It is a white amorphous or crystalline powder, odorless, tasteless, permanent, insoluble in water, alcohol, soluble in ammonia water and alkaline citrate solutions. *Impurities:* Nitrate, etc. Dose, gr. 1–3 (.06–.2 Gm.), but less locally as an astringent.

PREPARATION.—1. *Bismuthi et Ammonii Citras.* Bismuth and Ammonium Citrate—$BiC_6H_5O_7 + NH_4OH + 2H_2O$ (?). (Syn., Bismuthi Ammonio-citras, Bismuthum Citricum Ammoniatum ; Fr. Citrate de Bismuth (Ammoniacal) et d'Ammoniaque ; Ger. Citronensaures Wismuth (oxyd) Ammonium.)

Manufacture: Mix bismuth citrate 100 Gm. with distilled water 200 Cc., heat, adding ammonia water until salt dissolved, filter, evaporate to syrupy consistence, spread upon glass, dry. It is in small, shining, pearly, or translucent scales, odorless, slightly acidulous, metallic taste, opaque on exposure, soluble in water, sparingly in alcohol. *Impurities:* Nitrate, etc. Should be kept dark, in well-stoppered bottles. Dose, gr. 1–5 (.06–.3 Gm.).

PROPERTIES AND USES.—The citrate may be used like subnitrate, but chiefly official for preparing the double soluble salt (bismuth and ammonium citrate) ; astringent, irritant, inflammation of intestinal mucous membrane. Not nearly so valuable as the insoluble salts.

Bismuthi Subcarbonas. Bismuth Subcarbonate, $(BiO)_2CO_3,H_2O$ (?).—(Syn., Pearl White, Oxycarbonate of Bismuth, Bismuthum Subcarbonicum, Subcarbonas Bismuthicus, Bismuthyl Carbonate, Bismuthi Carbonas ; Fr. Sous-carbonate de Bismuth ; Ger. Basisches Kohlensaures Wismuthoxyd, Wismuth Subcarbonat.)

Manufacture: Dissolve purified bismuth in nitric acid diluted, filter, precipitate with ammonia water, wash and dissolve precipitate in nitric acid, pour this into solution of sodium carbonate, filter, wash, and dry precipitate. (1) $Bi + 4HNO_3 = Bi(NO_3)_3 + NO + 2H_2O$. (2) $2Bi(NO_3)_3 + 3Na_2CO_3 + H_2O = (BiO)_2CO_3,H_2O + 6NaNO_3 + 2CO_2$. It is a white or yellowish powder, varying composition, odorless, tasteless, permanent, insoluble in water, alcohol, soluble in HNO_3 or HCl, with effervescence. *Impurities:* Lead, copper, silver, arsenic, alkalies, alkaline earths, chloride, sulphate, nitrate. Dose, gr. 5–30 (.3–2 Gm.).

PROPERTIES AND USES.—Intended as a substitute for subnitrate, as it is a little more soluble, hence less likely to constipate and blacken the stools; but as these are disadvantages it is not much used.

Allied Salts:

1. *Bismuthi Salicylas. Bismuth Salicylate,* $Bi(C_7H_5O_3)_3Bi_2O_3$.—Obtained by precipitating solution of bismuth nitrate in glycerin with concentrated solution of sodium salicylate; contains bismuth oxide 76 p. c., salicylic acid 24 p. c. It is a cream-colored amorphous, odorless, tasteless, powder. Dose, gr. 5–30 (.3–2 Gm.).

PROPERTIES AND USES.—Antiseptic, diarrhœa, typhoid, intestinal catarrh.

Other important salts of bismuth are: the oxychloride, subiodide, subgallate (dermatol), tannate, valerianate.

ARGENTUM. SILVER.

$Ag^i = 107.7$.

(Official, 1830–1880.)

The element silver (AS. *seolfer; L. argentum;* Gr. *ἄργυρος*, white; *i. e.,* its bright, shining color) occurs natively as metal and sulphide—the latter, being along with lead sulphide—argentiferous galena, is simply roasted, when lead oxidizes into litharge and pure silver separates. Silver may also be obtained by amalgamation—dissolving it in mercury and distilling the amalgam, when mercury, being volatile, goes over, and silver remains behind. It is our whitest metal, best conductor of heat and electricity, takes brilliant polish, malleable, ductile, sp. gr. 10.4–10.5.

Tests for Silver Salts: 1. H_2S or NH_4SH precipitates black silver sulphide, Ag_2S. 2. Hydrochloric acid, or any soluble chloride, precipitates white curdy silver chloride, AgCl, insoluble in hot HNO_3, but soluble in ammonia water. 3. Alkaline hydroxides precipitate brown silver oxide, Ag_2O, soluble in ammonia water. 4. Metallic copper, zinc, or iron precipitates metallic silver.

Argenti Nitras. Silver Nitrate, $AgNO_3$.—(Syn., Lunar Caustic; Fr. Azotas (Nitras) Argenticus, Azotate (Nitrate) d'Argent, Nitre lunaire; Ger. Argentum Nitricum (Crystallizatum), Silbernitrat, Salpetersaures Silberoxyd, Silbersalpeter.)

Manufacture: Dissolve silver in nitric acid by heat, evaporate dry to expel free acid, dissolve dry mass in hot water, crystallize—$6Ag + 6HNO_3 = 6AgNO_3 + 6H$. It is in colorless, rhombic, transparent, tabular crystals, grayish-black by exposure to light and organic matter, odorless, bitter, caustic, metallic taste, soluble in water. *Assay:* Dissolve 0.34 Gm. in 10 Cc. water; this should require for complete precipitation 20 Cc. $\frac{N}{10}$ sodium chloride V. S. (corresponding to 100 p. c. pure salt). *Impurities:* Copper, lead, foreign salts. Should be kept dark, in dark-amber vials. Dose, gr. $\frac{1}{8}$–$\frac{1}{2}$ (.008–.03 Gm.), ter die in pill with bitter extracts, but not with bread containing salt, as this hastens decomposition; best given on empty stomach.

PREPARATIONS.—1. *Argenti Nitras Dilutus.* Diluted Silver Nitrate. Mitigated Caustic. (Syn., Nitrate of Silver and Potassium; Br. Argenti et Potassii Nitras, Argentum Nitricum Fusum Mitigatum, Lapis Infernalis Nitratus; Fr. Azotate d'Argent Mitigé, Pierre Infernale diluée; Ger. Argentum Nitricum cum Kalio Nitrico, Salpeterhaltiges Silbernitrat, Salpeterhaltiger Höllenstein.)

Manufacture: Silver nitrate 30 Gm., potassium nitrate 60 Gm., melt and mould; contains 33⅓ p. c. pure silver nitrate. It is white, hard, solid, in pencils or cones, fracture granular, odorless, caustic, metallic taste, soluble in water, alcohol, darkens by age. *Assay:* Dissolve 1 Gm. in 10 Cc. water + 20 Cc. $\frac{N}{10}$ sodium chloride + few drops potassium chromate T. S.; this should require 0.5 Cc. $\frac{N}{10}$ silver nitrate V. S. to give liquid permanent red color (corresponding to at least 33 p. c. pure $AgNO_3$. *Impurities:* Copper, lead, bismuth. Should be kept in amber-colored vials. Used when mild action desired.

2. *Argenti Nitras Fusus.* Moulded Silver Nitrate. Lunar Caustic. (Syn., Lapis Infernalis; Br. Argenti Nitras; Fr. Azotas (Nitras) Argenticus Fusus, Azotate (Nitrate) d'Argent fondu, Pierre Infernale; Ger. Argentum Nitricum (Fusum), Höllenstein, Geschmolzenes Salpetersaures Silberoxyd.)

Manufacture: Silver nitrate 100 Gm., hydrochloric acid 4 Gm., melt and mould. It is white, hard, solid, in pencils or cones, fracture fibrous, odorless, bitter, caustic, metallic taste, soluble in 0.6 part water, 26 alcohol, darkens by age. *Assay:* Dissolve 0.34 Gm. in 10 Cc. water + 20 Cc. $\frac{N}{10}$ sodium chloride V. S. + few drops potassium chromate T. S.; this should require 1 Cc. $\frac{N}{10}$ silver nitrate V. S. to give permanent red color (corresponding to 95 p. c. pure $AgNO_3$). The HCl is simply added to toughen the compound so that it can be more readily handled without breaking. Should be kept dark, in amber-colored vials.

PROPERTIES AND USES.—Alterative, stimulant, astringent (only externally), hæmostatic, escharotic (but does not act deeply), sedative, epilepsy, chronic spinal inflammation, locomotor ataxia, spasmodic tabes, ulcerations of alimentary tract, subacute gastritis, pyrosis, ulcer of stomach, chronic diarrhœa, catarrh of the gall-ducts, typhoid fever, neuralgia, dysentery, cholera, pregnant vomit, chronic jaundice, abnormal heart-action, bronchitis. Externally, diphtheritic exudations, croup (10 p. c.), chronic ulceration, simple inflammation, chronic laryngitis (1–5 p. c.), aphonia, whooping-cough, sore throat of speakers, tubercular and syphilitic tonsillitis, lymphatic glands, abscesses, iritis, sciatica, conjunctivitis (½–1 p. c.), corneal ulcers, hemorrhages from leech-bites, bedsores, poisoned and other wounds, mercurial sore mouth, chancre, smallpox, herpes, intertrigo, burns, erysipelas, gonorrhœa, leucorrhœa, otorrhœa, neck of bladder inflammation, vesical catarrh, urethral strictures, involuntary seminal emissions, enlarged prostate glands, corns, rectal ascarides.

Also much used in making indelible ink, dyes for hair, beard, etc. When used on the hair for a long time the system usually absorbs enough to produce poisonous symptoms, with permanent constitutional weakness. The stains can be removed by applying a solution of potassium cyanide, or potassium iodide, or tincture iodine + ammonia.

Poisoning: Have intense abdominal pain, muscular spasms, vomiting, purging, face livid, skin moist, black vomit containing coagulated mucus, coma, convulsions, paralysis, alteration of respiration; when chronic have skin, conjunctivæ and labial mucous membrane of a permanent slaty color, abdominal ulceration. Administer weak draught of sodium chloride (to decompose the nitrate), egg-white, milk, tannin, followed by emetic, opium for pain, sodium hyposulphite baths.

Incompatibles: Alkalies, carbonates, chlorides, hydrochloric acid, tannin, potassium iodide, arsenic solution.

Synergists: Copper, lead, zinc.

Argenti Cyanidum. Silver Cyanide, $AgCN$.—(Syn., Cyanuret of Silver, Argentum Cyanatum; Fr. Cyanure d'Argent; Ger. Cyansilber, Silbercyanid.)

Manufacture: Distil potassium ferrocyanide, sulphuric acid and water together, pass escaping HCN gas into solution of silver nitrate, wash, dry precipitate—(1) $AgNO_3 + HCN = AgCN + HNO_3$. (2) $AgNO_3 + KCN = AgCN + KNO_3$. It is a white powder, odorless, tasteless, permanent in dry air, darkens in the light, insoluble in water, alcohol, soluble in ammonia water, sodium hyposulphite, potassium cyanide. *Test:* When fused have cyanogen gas escaping and a residue of metallic silver—80.56 p. c. of original weight. Should be kept dark, in dark-amber vials. Dose, gr. $\frac{1}{60}$–$\frac{1}{20}$ (.001–.003 Gm.).

PREPARATION.—1. *Acidum Hydrocyanicum Dilutum.* Dose, ♏j–3 (.06–.2 Cc.).

The salt is official solely for making this acid.

Argenti Iodidum. Silver Iodide, AgI.—(Syn., Argentum Iodatum; Fr. Iodure d'Argent; Ger. Silberjodid, Jodsilber.)

Manufacture: By double decomposition between silver nitrate and potassium iodide, wash and dry precipitate—$AgNO_3 + KI = AgI + KNO_3$. It is a heavy, amorphous, yellowish powder, unaltered by light; if impure, becomes greenish-yellow, odorless, tasteless, insoluble in water, alcohol, dil. acids, soluble in solution of potassium cyanide. *Impurities:* Chloride, bromide. Should be kept dark, in amber-colored vials. Dose, gr. ⅛–½ (.008–.03 Gm.), ter die in pill.

PROPERTIES AND USES.—Similar to nitrate, and, from its not coloring the skin, once thought even a better salt, but not now so considered. Used in syphilis, visceral neuralgia, asthma, chorea, whooping-cough.

Agenti Oxidum. Silver Oxide, Ag_2O.—(Syn., Oxidum Argenticum, Argentum Oxydatum, Argentic Oxide; Fr. Oxide d'Argent; Ger. Silberoxyd.)

Manufacture: Shake silver nitrate solution with liquor potassæ, wash precipitate—$2AgNO_3 + 2KOH = Ag_2O + 2KNO_3 + H_2O$. It is a heavy brownish-black powder, decomposed by heat into metal and oxygen, insoluble in alcohol, partially so in water, soluble in HNO_3 without effervescence. *Impurities;* Carbonate, silver. Should be kept in dark amber-colored vials, and not brought in contact with ammonia, nor triturated with oxidizable or combustible substances. Dose, gr. ¼–1 (.016–.06 Gm.), ter die, in pill; ointment (10–20 p. c.) good externally.

PROPERTIES AND USES.—Similar to nitrate, but much weaker. Slight caustic, sedative; nausea, cardialgia, pyrosis, stomach-pains, dysentery, diarrhœa, night-sweats, dysmenorrhœa, menorrhagia, leucorrhœa, enlarged uterus with flooding, tænia, venereal sores, gonorrhœa, hemorrhages, gastric ulcers, dyspepsia, catarrhal affections, colors skin somewhat.

Incompatibles: Chlorides, organic substances, creosote, etc., these are oxidized, forming explosive compounds.

HYDRARGYRUM. MERCURY.

$Hg^{ii} = 199.8$.

(Syn., Quicksilver, Hydrargyrum Vivum, Mercurius Vivus, Argentum Vivum; Fr. Mercure, Vif Argent; Ger. Quecksilber.)

The element mercury (after the messenger of the gods, from its mobility, quicksilver, similar origin; L. *hydrargyrum;* Gr. ὕδωρ, water, + ἄργυρος, whiteness, lustre) is found as globules in the metallic state and as mercuric sulphide, cinnabar, in mines of Spain, Austria, California, Peru, Japan, Mexico. The metal is obtained by roasting cinnabar in the air, which dissipates SO_2 and leaves Hg behind, or can distil it with lime, which combines with the sulphur, and the mercury, being volatile, is conveyed into cooling chambers, where it condenses. It is a liquid metal, silver-white, odorless, tasteless, sp. gr. 13.56, solidifies at $-40°$ C. ($-40°$ F.), boils at 357° C. (675° F.), insoluble in ordinary solvents, HCl or cold H_2SO_4, soluble in HNO_3 and with heat in H_2SO_4; forms two series of compounds: 1. *mercuric* (Hg), 2. *mercurous* (Hg_2).

Tests for Mercury Salts: 1. H_2S or NH_4SH precipitates black mercuric (and mercurous) sulphide. 2. KI precipitates green mercurous iodide and red mercuric iodide, soluble in excess. 3. Potassium, sodium, or calcium hydroxide precipitates brownish-black mercurous oxide (Hg_2O) and yellow mercuric oxide (HgO). 4. Ammonium hydroxide precipitates black mercurous ammonium salt and white mercuric ammonium salt. 5. Metallic copper placed in acid mercuric solution soon becomes coated with metallic mercury.

PREPARATIONS.—1. *Emplastrum Hydrargyri.* Mercurial Plaster. (Syn., Emplastrum Mercuriale; Fr. Emplâtre mercuriel; Ger. Quecksilber-Pflaster.)

Manufacture: Triturate mercury 30 Gm. with oleate of mercury 1.2 Gm. until globules invisible, then add melted lead plaster q. s. 100 Gm., mix thoroughly.

2. *Emplastrum Ammoniaci cum Hydrargyro,* 18 p. c. Externally.

3. *Hydrargyrum cum Creta.* Mercury with Chalk. (Syn., Gray Powder, Æthiop's Cretaceus; Fr. Mercure avec la Craie; Poudre de Mercure crayeux; Ger. Quecksilber mit Kreide.)

Manufacture: Shake mercury 38 Gm., clarified honey 10, water 2 Cc. in a bottle until globules invisible, rub prepared chalk 57 Gm. with water q. s. for paste, to this add bottle contents, mix, dry to 100 Gm. It is a light-gray, dampish powder, non-gritty, odorless, sweetish taste, warm acetic acid dissolves the chalk. *Impurities:* Mercurous and mercuric oxides, which make it more powerful. Should be kept dark, in well-stoppered bottles, owing to the ready oxidation of such finely divided mercury. Dose, gr. 5–10 (.3–.6 Gm.), twice daily; children gr. 2–3 (.13–.2 Gm.).

4. *Massa Hydrargyri.* Mass of Mercury. (Syn., Pilula Hydrargyri, Blue Mass, Blue Pill, Massa Cœrulea, Pilulæ Cœruleæ; Fr. Masse pilulaire bleue, Pilule de Mercure; Ger. Mercurial Pillen (Masse).)

Manufacture: 33 p. c. Triturate together mercury 33 Gm., honey of rose 34 Gm., glycerin 3, until globules invisible, then add gradually glycyrrhiza 5 Gm., althæa 25 Gm., mix thoroughly. *Impurities:* Mercurous oxide (heat with acetic acid, add HCl, should get opalescence only), mercuric oxide ($HCl + H_2S$ no change when absent). Dose, gr. 3–15 (.2–1 Gm.).

5. *Unguentum Hydrargyri.* Mercurial Ointment. Blue Ointment. (Syn., Unguentum (Mercuriale) Neapolitanicum; Fr. Pomatum cum Hydrargyro, Pommade (Onguent) Mercurielle à parties égales, Pommade napolitaine; Ger. Graue Quecksilbersalbe.)

Manufacture: 50 p. c. Triturate mercury 50 Gm. with oleate of mercury 2 Gm. until globules invisible, then add lard 25 Gm., suet 23 Gm. previously melted, mix thoroughly.

PROPERTIES AND USES.—Mercury—stimulant, alterative, tonic, antiphlogistic, sorbefacient, not directly a cholagogue, causes salivation, the liver retains it longest. Used in meningitis, bronchitis, pleuritis, pneumonitis, dysentery, rheumatism, hydrocephalus, ascites, hydrothorax, dropsy, intestinal obstruction, malarial enlargement of spleen, smallpox. Plaster—Applied to syphilitic nodes, glandular engorgements, enlarged spleen, to cover face in smallpox. It not only gives support, but is a counter-irritant, while the mercury causes absorption and affects the system. Plaster with Ammoniac—discutient to syphilitic swellings, chronic hepatitis. Mercury with Chalk—similar to blue mass, only much weaker. Give to children deficient in biliary secretion, indicated by clay-colored stools, bowel complaints, diarrhœa, alterative in constitutional syphilis; the chalk is antacid. Blue Mass—sialagogue, alterative, irritant, cathartic; for the two former give gr. 3 (.2 Gm.) nightly or on alternate nights, following in the morning with a laxative; for the latter give gr. 5–15 (.3–1 Gm.), at night, and follow in the morning with a more certain purgative; good to increase liver and pancreas secretions. Mercurial Ointment—excellent externally, get resolvent effect by rubbing swollen or affected parts with it, and also a constitutional influence. Used in syphilis, when daily inunctions should be made under arms, flanks, thighs, chest, etc., swellings, glandular enlargements, engorged liver, spleen, inflamed joints, orchitis, smallpox eruptions, erysipelas, prurigo pudendi, warts, condylomata.

Hydrargyri Iodidum Flavum. Yellow Mercurous Iodide, Hg_2I_2.—(Syn., Hydrargyri Iodidum Viride, Protoiodide of Mercury, Yellow (Green) Iodide of Mercury, Hydrargyrii Protoioduretum, Ioduretum Hydrargyrosum, Hydrargyrum Iodatum, Hydrargyri Iodatum Flavum; Fr. Proto-iodure de Mercure, Iodure mercureux; Ger. Quecksilberjodür, Gelbes Jodquecksilber.)

Manufacture: Mercury 50 Gm., nitric acid 30 Cc., potassium iodide 24 Gm., distilled water, alcohol āā q. s. Results from the double decomposition between mercurous nitrate and potassium iodide—(1) $6Hg+8HNO_3=3Hg_2(NO_3)_2+4H_2O+2NO$. (2) $Hg_2(NO_3)_2+2KI=Hg_2I_2+2KNO_3$. The alcohol is for washing out any mercuric iodide that might have formed. It is a bright-yellow, amorphous powder, odorless, tasteless, insoluble in water, alcohol, ether, darkens on exposure, becoming metallic mercury and mercuric iodide. *Impurities:* Mercuric iodide, etc. Should be kept dark, in amber-colored vials. Dose, gr. ⅛–1 (.01–.06 Gm.), ter die, gradually increase until trebled, provided salivation or diarrhœa does not occur.

PROPERTIES AND USES.—In advanced syphilis, being by many considered the best salt for this trouble when constitutional.

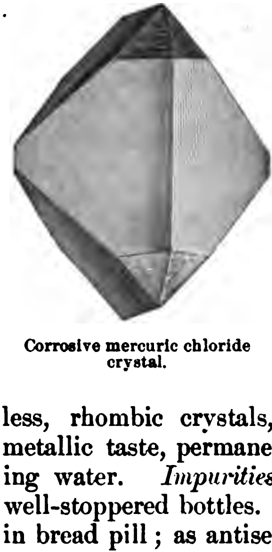
Hydrargyri Subsulphas Flavus. Yellow Mercuric Subsulphate, $Hg(HgO)_2SO_4$.—(Syn., Basic Mercuric Sulphate, Turpeth Mineral, Hydrargyri (Sulphas Flava) Subsulphas, Mercurius Emeticus Flavus, Sulphas Hydrargyricus Flavus, Turpethum Minerale, Oxymercuric Sulphate; Fr. Sulfate (trimercurique) jaune de Mercure; Ger. Basisches Quecksilberoxydsulfat, Mercurioxydsulfat, Mineralischer Turpeth.)

Manufacture: Dissolve mercury 100 Gm. in sulphuric acid 30 Cc. + distilled water 15 Cc., add gradually nitric acid 25 Cc. + distilled water 25 Cc., evaporate to dryness, powder and add it gradually to boiling distilled water 2,000 Cc., boil ten minutes (to convert normal into basic sulphate, the acid sulphate remaining in solution), wash and dry precipitate—$Hg_3 + 3H_2SO_4 + 2HNO_3 = 3HgSO_4 + 2NO + 4H_2O$; this sulphate when dried and boiled in water becomes the official salt. It is a heavy, lemon-yellow powder, odorless, tasteless, permanent, soluble in HNO_3, HCl, 2,000 parts water, 600 boiling water, insoluble in alcohol. *Impurities:* Mercurous salt, lead. Should be kept dark, in well-stoppered bottles. Dose, gr. 2–3 (.13–.2 Gm.), for child two years old, repeated in fifteen minutes. As alterative for adult, gr. $\frac{1}{4}$–$\frac{1}{2}$ (.016–.03 Gm.), emetic gr. 2–5 (.13–.3 Gm.), errhine gr. 1 (.06 Gm.) + starch q. s.; gr. 60 (4 Gm.) have killed.

PROPERTIES AND USES.—Alterative, emetic, errhine, irritant poison, salivates, croup, spasmodic laryngitis.

Hydrargyri Chloridum Corrosivum. Corrosive Mercuric Chloride, $HgCl_2$.—(Syn., Corrosive Chloride of Mercury, Corrosive Sublimate, Hydrargyrum (Muriaticum Corrosivum) Corrosivum Sublimatum, Hydrargyri (Bichloridum) Perchloridum, Mercurius Sublimatus Corrosivus, Chloruretum (Chloretum) Hydrargyricum; Fr. Deuto-chlorure de Mercure, Chlorure mercurique; Ger. Hydrargyrum Bichloratum, Quecksilberchlorid, Aetzendes Quecksilbersublimat.)

FIG. 435.



Corrosive mercuric chloride crystal.

Manufacture: (1) $Hg + 2H_2SO_4 = HgSO_4 + SO_2 + 2H_2O$, evaporate to dryness. (2) $HgSO_4 + 2NaCl = HgCl_2 + Na_2SO_4$, by sublimation have this latter left behind, or can heat mixture of mercuric sulphate, sodium chloride, and manganese dioxide—$HgSO_4 + 2NaCl + MnO_2 = HgCl_2 + Na_2SO_4 + MnO_2$, when mercuric chloride sublimes over. The MnO_2 is added to insure full liberation of chlorine and thus prevent formation of any mercurous chloride. It is in heavy, colorless, rhombic crystals, or masses, odorless, with acrid, persistent metallic taste, permanent, soluble in 16 parts water, 3 alcohol, 2 boiling water. *Impurities:* Foreign salts, arsenic. Should be kept in well-stoppered bottles. Dose, gr. $\frac{1}{50}$–$\frac{1}{8}$ (.0013–.008 Gm.), after meals in bread pill; as antiseptic dressing the solution (gr. 1 to 1,000–2,000) is valuable.

Incompatibles: Alkalies, their carbonates, potassium iodide, lime water, tartar emetic, lead acetate, silver nitrate, albumin, soap, tannin.

PREPARATIONS.—1. *Hydrargyrum Ammoniatum.* Ammoniated Mercury, NH_2HgCl. (Syn., White Precipitate, Mercuric Ammonium Chloride, Hydrargyrum (Amidato-bichloratum) Ammoniato-muriaticum, Hydrargyri Ammonio-Chloridum, Mercurius Præcipitatus Albus, Mercur-Ammonium Chloride; Fr. Chloramidure de Mercure, Oxychlorure Ammoniacal de Mercure, Lait Mercuriel, Mercure Précipité blanc; Ger. Weisser Quecksilber präcipitat, Quecksilber Chloridamidid.)

Manufacture: Dissolve corrosive mercuric chloride 100 Gm. in warm distilled water 2,000 Cc., filter, cool and pour gradually into ammonia water 150 Cc., wash precipitate with distilled water 400 Cc., + ammonia water 20 Cc., then dry—$HgCl_2 + 2NH_4OH = NH_2HgCl + NH_4Cl + 2H_2O$. It is in white pulverulent pieces, or amorphous powder, odorless, earthy, styptic, metallic taste, permanent. Long washing converts it into basic salt; nearly insoluble in water, alcohol, soluble in warm HCl, HNO_3 or acetic acid, and cold solution of ammonium carbonate. *Impurities:* Lead, mercurous salt, carbonate. Should be kept dark, in well-stoppered bottles.

Prep.: 1. *Unguentum Hydrargyri Ammoniati.* Ointment of Ammoniated Mercury. (Syn., Unguentum Præcipitati Albi, Ointment of White Precipitate; Fr. Pommade de Précipité blanc; Ger. Unguentum Hydrargyri Album, Weisse Quecksilbersalbe.)

Manufacture: 10 p. c. Rub ammoniated mercury 10 Gm. with benzoinated lard 90 Gm., gradually added, until thoroughly mixed.

2. *Hydrargyri Iodidum Rubrum.* Red Mercuric Iodide, HgI_2. (Syn., Biniodide of Mercury, Red Iodide of Mercury. Deuto-ioduretum (Biniodidum) Hydrargyri, Mercurius Iodatus Ruber, Ioduretum Hydrargyricum; Fr. Deuto-iodure (Bi-iodure) de Mercure, Iodure mercurique; Ger. Hydrargyrum bijodatum, Quecksilberjodid, Rothes Jodquecksilber.)

Manufacture: Dissolve corrosive mercuric chloride 40 Gm. and potassium iodide 50 Gm., each, in distilled water 800 Cc. filter, pour each simultaneously, but slowly, into distilled water 2,000 Cc., wash, dry precipitate—$HgCl_2 + 2KI = HgI_2 + 2KCl$. It is a scarlet-red, amorphous powder, odorless, tasteless, permanent, nearly insoluble in water, soluble in 130 parts alcohol, solution of KI, or $HgCl_2$. *Impurities:* Mercuric chloride, soluble chlorides and iodides. Should be kept dark, in well-stoppered bottles. Dose, gr. $\frac{1}{50}$–$\frac{1}{8}$ (.0013–.008 Gm.).

Prep.: 1. *Liquor Arseni et Hydrargyri Iodidi.* Solution of Arsenic and Mercuric Iodide, Donovan's Solution. (Syn., Solution of Hydriodate of Arsenic and Mercury, Solutio Donovani; Fr. Soluté d'Iodo-arsénite de Mercure, Liqueur de Donovan; Ger. Jodquecksilber-Arsenik-Lösung, Donovan'sche Tropfen.)

Manufacture: Triturate together arsenic iodide 1 Gm. and red mercuric iodide 1 Gm., then add distilled water 15 Cc., when dissolved add distilled water q. s. 100 Cc. It is a clear, pale-yellowish liquid, odorless, disagreeable metallic taste. Dose, ♏iij–5 (.2–.3 Cc.), ter die, diluted.

3. *Hydrargyri Oxidum Flavum.* Yellow Mercuric Oxide, HgO. (Syn., Hydrargyrum Oxidatum Flavum (Præcipitatum), Precipitated Oxide of Mercury, or Mercuric Oxide; Fr. Oxyde mercurique jaune (précipité), Oxide de Mercure jaune ou précipité, Deutoxyde jaune de Mercure; Ger. Hydrargyrum Oxydatum via Humida Paratum, Præcipitirtes (Gelbes) Quecksilberoxyd.)

Manufacture: Dissolve corrosive mercuric chloride 100 Gm. in warm distilled water 1,000 Cc. filter, also dissolve soda 40 Gm. in cold distilled water 1,000 Cc. and to this add former solution, wash, dry precipitate—$HgCl_2 + 2NaOH = HgO + 2NaCl + H_2O$. It is an orange-yellow, amorphous, heavy, impalpable powder, odorless, metallic taste, permanent in air, darkens by light, nearly insoluble in water, alcohol, soluble in dil. HCl or HNO_3. *Impurities:* Red mercuric oxide, chloride. Should be kept dark, in well-stoppered bottles.

Preps.: 1. *Unguentum Hydrargyri Oxidi Flavi.* Ointment of Yellow Mercuric Oxide. (Syn., Fr. Pommade d'Oxyde jaune de Mercure; Ger. Gelbe Quecksilberoxydsalbe.)

Manufacture: 10 p. c. Rub yellow mercuric oxide 10 Gm. with ointment 90 Gm., gradually added, until thoroughly mixed.

2. *Oleatum Hydrargyri.* Oleate of Mercury. (Syn., Hydrargyrum Oleicum—Oleïnicum—Elaïnicum, Mercuric Oleate; Fr. Oléate mercurique (de Mercure); Ger. Oelsaures Quecksilber, Quecksilber-oleat, Mercurioleat.)

Manufacture: 20 p. c. Add gradually yellow mercuric oxide 20 Gm. to oleic acid 80 Gm., keep at 40° C. (104° F.), and stir frequently until oxide dissolved. This can be well substituted for mercurial ointment, as it is more readily absorbed; for inflamed joints, indurations after abscesses, sycosis, tinea, psoriasis, eczema, hereditary syphilis.

PROPERTIES AND USES.—Corrosive Sublimate—like many mercury compounds, is tonic, alterative, diuretic, antiseptic, disinfectant, irritant poison. Seldom purges, and this can always be prevented by combining it with opium. Large doses cause vomiting, griping, pain in bowels, diarrhœa, small, irregular pulse. Good in advanced syphilis, chronic skin troubles and rheumatism, condylomata, engorged glands, diphtheria, pneumonia (injections). Externally, pseudo-membranous laryngitis, fetid bronchitis, phthisis, skin diseases, psoriasis, acne, freckles, prurigo pudendi, pityriasis, ophthalmia, granular conjunctivitis, rhus poison, pediculi pubis, malignant pustule, gonorrhœa, leucorrhœa, dysentery, cholera, hydrocele, wounds, ulcers, arthritis, parasites, vascular tumors. With lime water have yellow wash (*lotio flava, aqua phagedænica flava*), $\frac{3}{10}$ p. c., used for ill-conditioned sores, ulcers, etc. Ammoniated Mercury—is a less active irritant than some other salts; it is poisonous, and owing to careless manufacture, letting it be exposed to light, often contains corrosive mercuric chloride, it is not given internally, and the ointment is of most service in ophthalmia and skin diseases. Red Iodide—is a powerful irritant poison; scrofula, constitutional syphilis, rheumatic pains. Externally, stimulant to indolent syphilitic and scrofulous ulcers, glandular swellings, lupus, goitre, enlarged spleen, liver, granular eyelids, bronchitis, disinfectant. Can be applied in solution with potassium iodide (āā 1 to 50), or ointment (1–4 to 20). Donovan's Solution—is given as an alterative in psoriasis, impetigo, porrigo, lepra, pityriasis, lupus, venereal eruptions, chronic rheumatism, night-pains. Yellow Oxide—externally as stimulant escharotic in powder or ointments, chancres, indolent ulcers, ulcerated eyes.

Poisoning: Toxic doses of corrosive sublimate (red iodide, etc.) resemble arsenic, have strong metallic taste, frequent bloody evacuations, tenesmus, intense abdominal pains, vomiting, labored respiration, suppressed urine, syncope, salivation, insensibility, convulsions. Give egg-white, beaten up with water (1 egg for every 4 grains), follow at once with emetic to remove, hence avoid resolution of albuminous mercury compound, demulcents, milk, flour-paste, meat-broth, opiates.

Incompatibles: Alkalies, their carbonates, potassium and sodium iodides, lead acetate, silver nitrate, tartar emetic, sulphides, soap, albumin, vegetable infusions, lime water.

Hydrargyri Chloridum Mite. Mild Mercurous Chloride, Hg_2Cl_2. —(Syn., Calomel, Mild Chloride of Mercury, Hydrargyri Chloridum, Hydrargyrum Chloratum (Muriaticum) Dulce, Mercurius Dulcis, Calomelas, Chloruretum (Chloretum) Hydrargyrosum; Br. Hydrargyri Sub-chloridum, Sub-chloride (Sub-muriate—Protochloride) of Mercury; Fr. Protochlorure (Sous Muriate) de Mercure, Mercure doux; Ger. Hydrargyrum Chloratum (Mite), Quecksilberchlorür.)

Manufacture: Rub mercury with mercuric sulphate to form mercurous sulphate, sublime this with sodium chloride—(1) $Hg + 2H_2SO_4 = HgSO_4 + SO_2 + 2H_2O$. (2) $HgSO_4 + Hg = Hg_2SO_4$. (3) $Hg_2SO_4 + 2NaCl = Hg_2Cl_2 + Na_2SO_4$ (this salt being left behind). It can be obtained in powder by rapidly condensing these vapors (Hg_2Cl_2), when it is white, impalpable, becoming yellowish by heavy trituration, odorless, tasteless, permanent, insoluble in water, alcohol, ether, volatile by heat. *Impurities:* Mercuric chloride, ammoniated mercury. Should be kept in dark-amber bottles. Dose, gr. 5–15 (.3–1 Gm.). Children require more in proportion, thus two to three years old give gr. 2–3 (.13–.2 Gm.), and this often fails, only to be followed by castor oil. Better results are obtained by giving small and often repeated doses, thus gr. $\frac{1}{10}$ (.006 Gm.) hourly in tablet or powder with sugar or sodium bicarbonate (1 to 10) will usually act freely by time the tenth dose is taken.

PREPARATIONS.—1. *Pilulæ Antimonii Compositæ,* gr. ⅔ (.04 Gm.). Dose, 1–2 pills morning and evening.

2. *Pilulæ Catharticæ Compositæ,* gr. 1 (.06 Gm.). Dose, 1–3 pills.

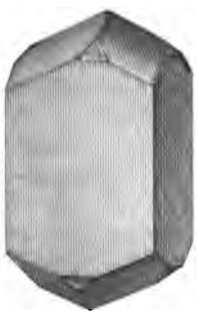
PROPERTIES AND USES.—Purgative, anthelmintic, alterative, cholagogue. Most valuable mercury salt'; lessens biliary secretion, causes salivation. Used for syphilis, typhoid, yellow and remittent fevers, inflammatory diseases, pericarditis, endocarditis, pleurisy, pneumonia, meningitis, hepatitis, dropsy, articular rheumatism, dysmenorrhœa, iritis, jaundice, pseudo-membranous laryngitis, bronchitis, dysentery, cholera, lumbricoid worms. With lime water have black wash (*lotio nigra, aqua phagedænica nigra*), ¾ p. c., used locally to syphilitic ulcers, etc. An ointment (10 p. c.) useful in scaly eruptions, condylomata, maggots, corneal ulcers.

Hydrargyri Oxidum Rubrum. Red Mercuric Oxide, HgO. —(Syn., Red Precipitate, Hydrargyri Nitrico-oxidum, Mercurius Corrosivus (Præcipitatus) Ruber, Peroxide of Mercury, Oxydum Hydrargyricum ; Fr. Deut-oxyde (Peroxyde) rouge de Mercure, Oxyde mercurique, Précipité rouge, Poudre de Jean de Vigo ; Ger. Hydrargyrum Oxydatum Rubrum, Rothes Quecksilberoxyd, Rother Präcipitat (Quecksilber Präcipitat).)

Manufacture: Dissolve mercury in nitric acid, then either heat alone or triturate this dried mercuric nitrate with mercury and heat—(1) $Hg_3 + 8HNO_3 = 3Hg(NO_3)_2 + 2NO + 4H_2O$. (2) $2Hg(NO_3)_2 +$ heat $= 2HgO + 4NO_2 + O_2$, or $2Hg(NO_3)_2 + Hg_2 +$ heat $= 4HgO + 2N_2O_4$. It is in heavy orange-red crystalline scales or powder, becoming more yellow as its fineness increases, odorless, metallic taste, permanent, insoluble in water, alcohol; soluble in dil. HNO_3 or HCl. *Impurities:* Yellow mercuric oxide, nitrate, chloride. Should be kept dark, in well-stoppered bottles. Dose, gr. $\frac{1}{10}$ (.006 Gm.), in syphilis.

PREPARATIONS.—1. *Unguentum Hydrargyri Oxidi Rubri.* Ointment of Red Mercuric Oxide. (Syn., Unguentum Præcipitatum Rubrum ; Fr. Pommade de Précipité (d'Oxyde) rouge de Mercure, Pommade de Lyon, Baume ophthalmique rouge ; Ger. Unguentum Hydrargyri Rubrum, Rothe Quecksilbersalbe.)

FIG. 436.



Mercuric cyanide crystal.

Manufacture: 10 p. c. Triturate red mercuric oxide 10 Gm. with castor oil 5 Gm. until smooth, then gradually incorporate ointment 85 Gm.

2. *Hydrargyri Cyanidum.* Mercuric Cyanide, $Hg(CN)_2$. (Syn., Hydrargyrum Borussicum, Cyanuretum Hydrargyricum, Cyanuret (Bi-cyanide—Prussiate) of Mercury; Fr. Cyanure (Bi-cyanure—Prussiate) de Mercure ; Ger. Hydrargyrum Cyanatum, Quecksilber-Cyanid, Cyanquecksilber.)

Manufacture: Dissolve mercuric oxide in hydrocyanic acid, the latter being prepared from potassium ferrocyanide and sulphuric acid—$HgO + 2HCN = Hg(CN)_2 + H_2O$; usually pass HCN gas into mercuric oxide in water, when soluble $Hg(CN)_2$ is formed, evaporate to crystallize. It is in white prismatic crystals, odorless, bitter metallic taste, darkens by light, exceedingly poisonous, soluble in 12.8 parts water, 15 alcohol. *Impurities:* Mercuric chloride, etc. Should be kept in well-stoppered bottles. Dose, gr. $\frac{1}{16}$–$\frac{1}{8}$ (.004–.008 Gm.).

3. *Liquor Hydrargyri Nitratis.* Solution of Mercuric Nitrate. (Syn., Liquor Hydrargyri Nitrici Oxydati, Hydrargyrum Oxydatum Nitricum Solutum, Acid Solution of Nitrate of Mercury, Solution of Pernitrate of Mercury ; Br. Liquor Hydrargyri Nitratis Acidus ; Fr. Azotate (Nitrate) mercurique liquide, Nitrate Acide (Deutazotate—Pernitrate) de Mercure (liquide) ; Ger. Flüssiges Salpetersaures Quecksilberoxyd, Mercurinitrat-Lösung, Quecksilberoxyd-nitrat-Lösung.)

Manufacture: Mix nitric acid 45 Gm. with distilled water 15 Gm., then in this dissolve red mercuric oxide 40 Gm. It is a clear liquid containing 60 p. c. mercuric nitrate $Hg(NO_3)_2$, together with 11 p. c.

free HNO_3, nearly colorless, heavy, nitric acid odor, sp. gr. 2.100. *Impurities:* Mercurous salt (nitrate), etc.

Properties and Uses.—Red Oxide—not used much internally, but mostly externally as stimulant, escharotic, ulcers, wounds, indolent syphilitic sores, condylomata, corneal opacity, granular eyelids, pannus, ozæna in powder or ointment. The yellow oxide has nearly replaced this salt. Mercuric Cyanide—used instead of corrosive sublimate for constitutional syphilis, diphtheria (gargle, 1 to 10,000). Liquor Hydrargyri Nitratis—used as a caustic for cancers, lupus, ulcerations of uterus, chancres, acne, boils, syphilitic sores, very poisonous, which may result even from skin absorption.

Allied Salt:

1. *Hydrargyri Sulphidum Rubrum. Red Sulphide of Mercury, Cinnabar,* HgS.—Official, 1880–1890. Obtained thus: Mercury 40 parts is gradually added to melted sublimed sulphur 8 parts, constantly stirring; the mass is heated until it begins swelling, then cooled under close cover, rubbed into powder and sublimed. It is a mercuric salt and occurs in brilliant dark-red crystalline masses, or bright-scarlet powder, odorless, tasteless, permanent, insoluble in water, alcohol, nitric or hydrochloric acid, soluble in nitromuriatic acid, sp. gr. 8.12. *Impurities:* Arsenic, antimony, chromates, iodides, sulphides, red oxide of mercury, red oxide of lead.

Uses.—By fumigation as a sialagogue in syphilitic affections.

ARSENUM (ARSENICUM). ARSENIC.

$As^{iii-v} = 74.9.$

(Official, 1850–1880.)

The element arsenic (L. *arsenicum*, fr. Gr. *αρσενικόν*, orpiment; lit. masculine, strong; *i. e.*, powerful poison) is widely distributed, but generally in small quantities; occurs as native arsenic (cobaltum or flystone), as two sulphides (red orpiment or realgar, As_2S_2, and yellow orpiment, As_2S_3), and as arsenides of various metals (arsenical pyrites or mispickel, FeAsS, cobalt glance, $CoS_2,CoAs_2$, and tin white cobalt, $CoAs_2$). The metal can be obtained by heating arsenical pyrites—$FeS_2,FeAs_2 + \text{heat} = 2As + 2FeS$. Arsenic being volatile, passes over, condenses, and should be purified by heating with charcoal, as it may contain As_2O_3, thus—$As_2O_3 + 3C = 3CO + 2As$. Metal is steel-gray, metallic mass, losing lustre by forming a film of oxide, brittle, volatile, sp. gr. 5.73–5.88; used as a fly poison and in shot (alloy of lead and arsenic). Forms two kinds of salts—*arsenous* (lower) and *arsenic* (higher).

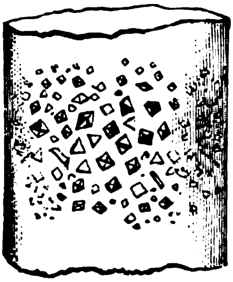
Tests for Arsenic Salts: 1. H_2S in acid solution precipitates bright yellow orpiment, As_2S_3, soluble in ammonia water. 2. $AgNO_3$ with ammonia water precipitates in neutral solutions of arsenous acid, yellow silver arsenite, Ag_3AsO_3, in arsenic acid solution get reddish-brown precipitate of silver arsenate, Ag_3AsO_4. 3. Cupric sulphate + arsenous acid + ammonia water precipitates Scheele's green—cupric arsenite,

$CuHAsO_3$. 4. Marsh's test: add to arsenic solution Zn + H_2SO_4, the escaping H gas when ignited deposits brown metallic ring upon cold porcelain, soluble in solution of chlorinated lime (bleaching powder). 5. Reinsch's test: Add bright copper plate to acid arsenical solution, heat, when it becomes coated with film of metallic arsenic.

Acidum Arsenosum. Arsenous Acid, As_2O_3.—(Syn., Arsenic Trioxide, White Arsenic, Flowers of Arsenic, Arsenicum Album, Arsenic, Arsenious Anhydride; Fr. Acide arsénieux, Arsenic blanc, Fleurs d'Arsenic; Ger. Acidum Arsenicosum, Arsenige Säure, Weisser Arsenik.)

Manufacture: This is often a by-product in separating metal from the ores metallurgically, when by roasting it sublimes. It only becomes acid in the presence of water—$2As_2O_3 + 6H_2O = 4H_3AsO_3$, is a heavy solid, amorphous, transparent, colorless like glass, or crystalline, white like porcelain, which gradually becomes opaque, odorless, tasteless, soluble in 5 parts glycerin, slowly in water (glassy in 30 parts, porcelain-like in 80 parts), twice as soluble in boiling water. *Assay:* Dissolve 0.1 Gm. + sodium bicarbonate 1 Gm. in water 20 Cc. + heat; this should decolorize 20 Cc. $\frac{N}{10}$ iodine V. S. (corresponding to 98.8 p. c. arsenic trioxide). *Impurities:* Arsenic acid, antimony, tin, cadmium, arsenic sulphide. Dose, gr. $\frac{1}{30}$–$\frac{1}{15}$ (.002–.004 Gm.), on full stomach until eyes begin to puff or curative effect produced.

FIG. 437.



Sublimate of arsenous acid, magnified.

PREPARATIONS.—1. *Liquor Acidi Arsenosi.* Solution of Arsenous Acid. (Syn., Solution of Arsenic Chloride, Hydrochloric Solution of Arsenic, Liquor Arsenici (Chloridi) Hydrochloricus; Fr. Liqueur arsénicale hydrochlorique; Ger. Chlorarsenik-Lösung.)

Manufacture: 1 p. c. Mix diluted hydrochloric acid 5 Cc. with distilled water 25 Cc., add arsenous acid 1 Gm., boil until dissolved, filter, add distilled water q. s. 100 Cc. It is a clear, colorless liquid, odorless, acid taste. *Assay:* 24.7 Cc. boiled a few minutes with sodium bicarbonate 2 Gm., cooled, diluted with water q. s. 100 Cc. + little starch T. S.; this should require 49.4–50 Cc. $\frac{N}{10}$ iodine V. S. to produce blue tint of iodide of starch (corresponding to 1 Gm. of arsenous acid in 100 Cc. of solution). Dose, ♏iij–5 (.2–.3 Cc.), ter die, diluted.

2. *Liquor Potassii Arsenitis.* Solution of Potassium Arsenite. Fowler's Solution. (Syn., Arsenical Solution, Solutio Arsenicalis Fowleri, Kali Arsenicosum Solutum, Liquor Arsenicalis; Fr. Liqueur (Solution) arsenicale de Fowler; Ger. Liquor Kalii Arsenicosi, Fowler'sche (Lösung) Tropfen.)

Manufacture: 1 p. c. Boil arsenous acid 1 Gm. and potassium bicarbonate 2 Gm. with distilled water 10 Cc. until dissolved, add distilled water q. s. 97 Cc., then compound tincture of lavender 3 Cc.

Assay: Same as preceding. Dose, ♏iij–5 (.2–.3 Cc.), ter die, diluted.

3. *Arseni Iodidum.* Arsenic Iodide, AsI_3. (Syn., Arsenici Iodidum, Ioduretum Arseniosum; Fr. Iodure d'Arsenic; Ger. Arsenicum (Arsenum) Jodatum, Arsenik Jodur, Arsentrijodid.)

Manufacture: 1. $As_2O_3 + 6HCl$ (hot) $= 2AsCl_3 + 3H_2O$, which by double decomposition with KI gives AsI_3 thus—$2AsCl_3 + 6KI = 2AsI_3 + 6KCl$. 2. $As_2O_3 + 6HI = 2AsI_3 + 3H_2O$. 3. Triturate and heat together metallic arsenic 75 parts and iodine 380. It is in glossy orange-red crystalline masses, or scales, iodine odor and taste, gradually loses iodine on exposure, soluble in 7 parts water, 30 alcohol, also in ether. Should be kept dark, cool, in glass-stoppered vials. Dose, gr. $\frac{1}{20}$–$\frac{1}{10}$ (.003–.006 Gm.).

Prep.: 1. *Liquor Arseni et Hydrargyri Iodidi,* 1 p. c. Dose, ♏iij–5 (.2–.3 Cc.), ter die, diluted.

PROPERTIES AND USES.—Arsenous Acid—alterative, anaphrodisiac, irritant poison, nervine, tonic, chronic malaria, intermittents, skin diseases, eczema, psoriasis, lepra, prurigo, nervous debility, chorea, chronic rheumatism, gout, chronic syphilitic affections, frontal neuralgia, hemicrania, obesity, gastralgia, anæmia, spasmodic asthma, amenorrhœa, dysmenorrhœa, menorrhagia, leucorrhœa, diabetes, albuminuria, chronic diarrhœa. Externally, cancers, lupus, epithelial tumors, sarcoma, warts, malignant ulcers, carious teeth. The two liquors are good forms of administration, but it may also be given in tablet, pill, etc. Arsenic Iodide—alterative, irritant poison, used like the acid, but mostly in pill form and never should be applied on abraded surfaces; Donovan's solution and the ointment ($\frac{1}{2}$–1 p. c.) have reasonable popularity.

Poisoning: All arsenic compounds produce symptoms resembling cholera: constriction and heat of fauces, faintness, nausea, burning abdominal pain and tenderness, thirst, violent retching, vomiting (brown often streaked with blood), bloody stools, tenesmus, strangury, cold skin, small and feeble pulse, spasms, dyspnœa, death in collapse. Wash out stomach, give emetics, follow with recently prepared ferric hydrate, or ferric hydrate with magnesia, dialyzed iron, to envelope, as well as to form insoluble ferric arsenite or arsenate, chalk, lime water, demulcents, opiates, remove iron compound with zinc sulphate.

Incompatibles: Salts of iron, silver, copper, ammonium, calcium, magnesia, vegetable astringents.

Synergists: Restoratives, nux vomica, etc.

ANTIMONIUM. ANTIMONY (STIBIUM).

$Sb^{iii-v} = 119.6.$

(Official, 1830–1840.)

The element antimony (Gr. ἀντί, against, + *moine,* monk—monksbane, poisons monks; or Gr. ἀντί, against, + μόνος, alone—never found alone; or Gr. ἀντί, instead of, + L. *minium,* red lead—women once used it instead of red lead for painting the eyes; L. *stibium,* Gr. στίβι, name of sulphide of antimony) has several official compounds, and occurs natively uncombined, also as oxide, oxysulphide and mostly as sulphide. From this latter the metal is obtained by roasting it into an oxide, then reducing that with charcoal. It is brittle, bluish-white, like silver, crystalline structure, sp. gr. 6.7; forms *antimonous* and *antimonic* compounds.

Tests for Antimony Salts: 1. H_2S in acid solution precipitates orange-red antimonous or antimonic sulphide, Sb_2S_3 or Sb_2S_5, soluble in ammonia water. 2. The sulphide dissolved in HCl and thrown into water precipitates white oxychloride. 3. Zinc and iron precipitate antimony as black powder from its solutions, while copper precipitates it as a black metallic film upon itself, which when heated volatilizes the antimony, depositing it as antimonous oxide. 4. Marsh's test; here brown rings are produced on porcelain, as in arsenic, which are insoluble in solution of chlorinated lime (bleaching powder).

Antimonii Sulphidum. Antimony Sulphide, Sb_2S_3.—(Syn., Antimony Trisulphide, Antimonium (Crudum) Nigrum, Black (Crude) Antimony, Sulfuretum Stibicum, Antimonous Sulphide; Fr. Sulfure d'Antimoine, Antimoine (cru) sulfuré; Ger. Stibium Sulfuratum Nigrum, Schwefelspiessglanz, Spiessglanz, Schwefelantimon.) It is native antimony sulphide purified by fusion and free from arsenic as possible.

Manufacture: The native ore, stibnite, Europe, United States, is grayish-black and contains galena, iron pyrites, quartz, and heavy spar; this is heated in pots, whereby fusible antimony sulphide runs off into earthen vessels to cool. It is in steel-gray masses, metallic lustre, striated, crystalline fracture, forming grayish-black lustreless powder, odorless, tasteless, permanent, soluble in HCl, insoluble in water, alcohol. Dose, gr. 10–30, in powder or bolus.

PREPARATIONS.—1. *Antimonii Sulphidum Purificatum.* Purified Antimony Sulphide, Sb_2S_3. (Syn., Purified Antimony Trisulphide (Black Antimony), Artificial (Prepared) Sulphuret of Antimony; Fr. Sulfuré d'Antimoine depuré; Ger. Gereinigtes Schwefelantimon.)

Manufacture: Antimony sulphide 100 Gm., ammonia water 50 Cc., water q. s. for elutriation. Powder antimony sulphide very fine, remove coarser particles by elutriation, and then macerate the fine subsiding sulphide in the ammonia water for five days, frequently agitating to remove any arsenic present, then wash with water, dry; it is a heavy, blackish lustreless powder, odorless, tasteless, permanent, insoluble in water, alcohol, soluble in HCl with evolution of H_2S. *Impurities:* Arsenic, etc.

Prep.: 1. *Antimonium Sulphuratum.* Sulphurated Antimony, Kermes Mineral. (Syn., Antimonii Oxysulphuretum—Sulphuretum (Aureum) Præcipitatum, Golden Sulphur; Fr. Sulfure d'Antimoine Précipité, Soufre doré d'Antimoine; Ger. Gefälltes Schwefelantimon, Goldschwefel.) This is chiefly antimony trisulphide, Sb_2S_3, with very little antimony trioxide.

Manufacture: Boil for two hours purified antimony sulphide 100 Gm., solution of soda 1,200 Cc., distilled water 3,000 Cc., frequently stirring, and adding water to preserve volume, strain, drop into it, while hot, diluted sulphuric acid q. s. to completely precipitate, wash precipitate with hot distilled water, dry, reduce to powder. It is an amorphous, reddish-brown powder, odorless, tasteless, losing color in the light. *Impurities:* Calcium, sulphate, chloride. Should be kept dark, in well-stoppered bottles. Dose, alterative, gr. 1–2 (.06–.13 Gm.), twice daily in pill; emetic, gr. 5–20 (.3–1.3 Gm.).

Prep.: 1. *Pilulæ Antimonii Compositæ.* Compound Pills of Antimony, Plummer's Pills. (Syn., Pilula Calomelanos Composita, Compound Calomel Pill, Pilula Hydrargyri Subchloridi Composita; Fr. Pilules (altérantes composées) antidartreuses—de Plummer; Ger. Plummer'esch-Pillen.)

Manufacture: Mix together sulphurated antimony 4 Gm., mild mercurous chloride 4 Gm., guaiac 8 Gm., then form mass with castor oil q. s. 100 pills. Dose, 1–3 pills.

2. *Antimonii Oxidum.* Antimony Oxide. Antimony Trioxide, Sb_2O_3. (Syn., Stibium Oxydatum, Oxydum Antimonicum (Stibicum), Antimonous Oxide; Fr. Oxyde d'Antimoine; Ger. Antimonoxyd.)

Manufacture: Pour a solution of antimony chloride into water, this precipitates the oxychloride which is to be treated with sodium carbonate—(1) $Sb_2S_3 + 6HCl = 2SbCl_3 + 3H_2S$. (2) $12SbCl_3 + 15H_2O = 2SbCl_3,5Sb_2O_3 + 30HCl$. (3) $2SbCl_3,5Sb_2O_3 + 3Na_2CO_3 + 6Sb_2O_3 + 6NaCl + 3CO_2$. It is a heavy, grayish-white powder, odorless, tasteless, permanent, nearly insoluble in water, alcohol, soluble in HCl, warm solutions of tartaric acid or potassium bitartrate. *Impurities:* Iron, copper, lead, arsenic, sulphate, chloride. Dose, gr. 2–4 (.13–.26 Gm.).

Preps.: 1. *Pulvis Antimonialis.* Antimonial Powder, James' Powder. (Syn., Pulvis (Antimonii Compositus) Jacobi; Fr. Poudre antimoniale de James; Ger. James'sches Antimonpulver.)

Manufacture: Mix intimately antimonous oxide 33 Gm., precipitated calcium phosphate 67 Gm. Dose, gr. 3–15 (.2–1 Gm.).

2. *Antimonii et Potassii Tartras.* Antimony and Potassium Tartrate, $2K(SbO)C_4H_4O_6 + H_2O$. (Syn., Tartar Emetic, Tartrated Antimony, Antimonium (Tartaratum) Tartarisatum, Tartarus Emeticus, Stibio-Kali Tartaricum; Fr. Tartrate d'Antimoine et de Potasse, Emétique, Tartre stibié; Ger. Tartarus Stibiatus, Brechweinstein.)

Manufacture: Antimony oxide 150 Gm. + potassium bitartrate 180 Gm. + water 1,000 Cc., boil together one hour, let crystallize—$2KHC_4H_4O_6 + Sb_2O_3 = 2K(SbO)C_4H_4O_6,H_2O$. It is in colorless, transparent crystals, becoming opaque by exposure, white or in white granular powder, odorless, sweet disagreeable metallic taste, soluble in 17 parts water, 3 boiling water, insoluble in alcohol. *Assay:* Dissolve 0.331 Gm. in 10 Cc., water + 20 Cc. cold saturated solution of sodium bicarbonate + little starch T. S.; this should require 20 Cc. $\frac{N}{10}$ iodine V. S. to cause permanent blue color (corresponding to 100 p. c. pure salt). *Impurities:* Calcium, iron, arsenic, sulphate, chloride, potassium bitartrate. Should be kept in well-stoppered bottles. Dose, alterative gr. $\frac{1}{32}$–$\frac{1}{16}$ (.002–.004 Gm.); diaphoretic, expectorant, gr. $\frac{1}{12}$–$\frac{1}{6}$ (.005–.01 Gm.); nauseating sudorific gr. $\frac{1}{8}$–$\frac{1}{4}$ (.01–.016 Gm.), every few hours; emetic, gr. $\frac{1}{2}$ (.03 Gm.), repeated every twenty minutes with warm water or chamomile tea until vomiting occurs.

Preps.: 1. *Vinum Antimonii.* Wine of Antimony. (Br. Vinum Antimoniale—Stibiatum—Emeticum; Fr. Vin (antimonié—émétique) stibié; Ger. Brechwein.)

Manufacture: Dissolve antimony and potassium tartrate 4 Gm. in boiling distilled water 6.5 Cc., and add this to alcohol 15 Cc., white wine 80 Cc., previously mixed. Dose, ♏x–30 (.6–2 Cc.), repeated as desired; as emetic for children ʒss–1 (2–4 Cc.), repeated every fifteen minutes until vomiting occurs.

2. *Syrupus Scillæ Compositus*, $\frac{1}{5}$ p. c. Dose, ♏v–60 (.3–4 Cc.).

PROPERTIES AND USES.—Antimony Sulphide—diaphoretic, alterative; scrofula, glandular obstructions, cutaneous diseases, chronic rheumatism. Seldom used in medicine, owing to its uncertain action, but popular for veterinary usage. Purified Sulphide—only used for pharmaceutical purposes, not prescribed internally. Sulphurated Antimony—alterative, diaphoretic, emetic, but an uncertain medicine. Pills used in secondary syphilis, skin eruptions; acids should be avoided while taking these. Antimony Oxide—seldom used in medicine, although possessing antimonial properties; owing to its limited solubility does not nauseate or vomit very much. James' Powder—diaphoretic in febrile conditions. Tartar Emetic—sedative, diaphoretic, expectorant, antiphlogistic, emetic, febrile complaints, first stage of bronchitis, pneumonia, pleurisy, acute rheumatism, tonsillitis, mammary abscess, hernia humoralis, ophthalmia, mumps, skin troubles, eczema, urticaria, psoriasis, dropsy, salivation, meningitis, epilepsy, chorea, mania, convulsions, mania-à-potu, rigid os uteri, strangulated hernia, dislocations, nævi, varicose veins. Externally, applied in strong solution or ointment have pustular eruptions like those of smallpox, producing scabs and indelible scars. Antimony Wine—a good form for diaphoresis in fever crisis, febrifuge, expectorant.

Poisoning: Symptoms similar to arsenic, but less marked; have stomach pain, incessant retching, præcordial cramps, burning heat, distended epigastrium, colic, frequent watery stools, dry throat, salivation, difficult deglutition, skin cool, clammy, muscles relaxed, pulse feeble, thready, respiration slow, scanty bloody urine, death may be preceded by stupor, mild delirium, or convulsions. Wash stomach out with solution of tannic acid, green tea, or galls, then demulcent drinks, egg-white, milk, warmth, friction, electricity, opium, stimulants; tartar emetic gr. 2–5 (.13–.3 Gm.) have killed.

Incompatibles: Opium, alcohol, cardiac stimulants, antispasmodics, tannin, gallic acid, lead salts.

Synergists: Emetics, cathartics, cardiac depressants.

STANNUM. TIN.

$Sn^{ii\text{-}iv} = 118.8.$

(Official, 1830–1860.)

The element tin (AS. *tin*, *stean*, *stan*, a stone; L. *stannum*, found at Cornwall as oxide, tin-stone) occurs chiefly as native stannic oxide (tin-stone), SnO_2. The metal is obtained by heating this oxide with carbon—$SnO_2+2C=Sn+2CO$. It is a nearly silver-white metal, very malleable, fusing at 228° C. (440° F.); forms two series of compounds, *stannous* and *stannic*.

Tests for Tin Salts: 1. With H_2S in stannous solution get brown stannous sulphide. 2. With H_2S in stannic solution get yellow stannic sulphide, both precipitates being soluble in ammonium sulphide.

Tin is used in alloys, with mercury to silver mirrors, and to coat sheet iron to yield tin plate. The stannous chloride, $SnCl_2$, is a great deoxidizing agent used to precipitate the metals, mercury, gold, and in calico-printing.

AURUM. GOLD.

$Au^{i\text{-}iii} = 196.7.$

(Official, 1830–1840.)

The element gold (AS. *geolu*, *giolo*, yellow; Gr. *χλωρός*; L. *aurum*, yellowish; *i.e.*, color of the metal) usually occurs in the metallic state with other metals, but sometimes as sulphide. It is separated from adhering rock, sand, etc., by washing—its greater specific gravity (19.3) enabling it to remain behind or subside. When pure it is quite soft, so that for general use it is alloyed with harder metals. Jewelers recognize the pure metal as 24 carat (seldom employed), and when mixed with 25 p. c. of copper or silver as 18 carat. It is affected by none of the pure acids, only being dissolved by nitrohydrochloric-acid, free chlorine or bromine, and mercury, forming with this latter an amalgam.

Tests for Gold Salts: 1. H_2S precipitates brown auric sulphide, Au_2S_3, soluble in ammonium sulphide. 2. $FeSO_4$ added and set aside soon precipitates metallic gold in dark powder, which by fusion is converted into a metallic button. 3. Stannous chloride precipitates purple (of Cassius).

Auri et Sodii Chloridum. Gold and Sodium Chloride.—(Syn., Chloruretum Aurico-Sodicum; Fr. Chloraurate de Sodium, Chlorure d'Or et de Sodium; Ger. Auro-Natrium Chloratum, Natriumgoldchlorid.)

Manufacture: Gold 13 parts, dissolve in a mixture of nitric (16 parts) and hydrochloric (48 parts) acids, add water q. s. 40 parts. To this add dry sodium chloride 20 parts, evaporate to dryness with stirring. (1) $Au_2 + 2HNO_3 + 8HCl = 2HAuCl_4$ or $2(AuCl_3 + HCl) + 2NO + 3H_2O$. (2) $HAuCl_4 + NaCl = NaAuCl_4$ or $(AuCl_3 + NaCl) + HCl$. It is a mixture of about equal weights of dry gold chloride, $AuCl_3$, and sodium chloride, NaCl, being an orange-yellow powder, odorless, saline, metallic taste, deliquescent in damp air, soluble in water, one-half in alcohol, decomposed into gold by heat. *Assay:* Dissolve 0.5 Gm. in 50 Cc. water + 5 Cc. dil. H_2SO_4 + 1 Gm. oxalic acid + two hours heat on water-bath gives precipitate of metallic gold, which, when washed, dried, and ignited should weigh 0.15 Gm. (corresponding to 30 p. c. metallic gold). *Impurities:* Free acid, etc. Should be kept in well-stoppered vials. Dose, gr. $\frac{1}{20}$–$\frac{1}{4}$ (.003–.016 Gm.); supposed to be the basis of the "Keeley cure," along with hypodermic atropine and strychnine, etc.

PROPERTIES AND USES.—Resembles mercury, used for syphilis, scrofula, sclerosis of the spine, liver, and kidneys, hypochondriasis, asthma, dysmenorrhœa, migraine, epilepsy, chorea, hysteria, consumption, habitual inebriety. Externally, caustic, like $AgNO_3$, for lupoid, cancerous, and other ulcers. In addition to the double chloride, the bromide, iodide and oxide are also used in doses of gr. $\frac{1}{20}$–$\frac{1}{4}$ (.003–.016 Gm.), after meals; also the powdered metal may be given in doses gr. $\frac{1}{6}$–1 (.01–.06 Gm.).

PLATINUM.

$Pt^{ii\text{-}iv} = 194.3.$

The element platinum (Sp. *platina,* dim. of *plata,* plate, silver—the two metals resemble in appearance), like gold, occurs mostly in the free state and in combination with iridium, osmium, palladium, rhodium, ruthenium, etc., metals resembling it; also in ores containing gold, lead, iron, silver; comes mainly from Ural Mountains and California. It is silvery white, soft like copper, malleable, ductile, high fusing point and great resistance to chemicals, soluble in nitrohydrochloric, or nitrohydrobromic acid, good conductor of heat and electricity, sp. gr. 21.5; forms two series of compounds—*platinous,* $PtCl_2$, and *platinic,* $PtCl_4$.

Platini Chloridum. Platinic Chloride, $PtCl_4,5H_2O$.—(Syn., Fr. Perchlorure de Platine; Ger. Platinchlorid.)

Manufacture: Platinum 3 parts + hydrochloric acid 16 + nitric acid 7, evaporate nearly to dryness, redissolve in HCl, heat to expel HNO_3, evaporate to dryness; contains 46 p. c. platinum.

PREPARATION.—1. *Platinic Chloride Test Solution:* 1.7 Gm. dissolved in 20 Cc. distilled water.

PROPERTIES AND USES.—Very slightly used in medicine, although the chloride has done much good in syphilis of constitutional form in doses gr. $\frac{1}{8}$–$\frac{1}{2}$ (.008–.03 Gm.); the injection (1 p. c.) has been effective in leucorrhœa, gleet, indolent ulcers.

PART IV.

ORGANIC CARBON COMPOUNDS.

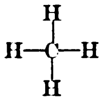
WHILE at present the number of official preparations made from organic substances are quite few, compared with the many that have already gained medical favor, yet those which the *Pharmacopœia* has accepted are among our most important and universally employed agents. The list of these is daily growing, and as many, built artificially and synthetically, are but reproductions in strength, effect, medical properties, etc., of natural plant-products, we can well predict a future when such organic compounds in many cases will be recognized to replace those of all other sources. As materia medica products are either inorganic or organic, and as the former comprise two great series: metals and metalloids, so the latter has two distinctive series: fatty and aromatic, consequently in this relationship-sequence they will be considered.

The term organic medicines was for a long time only applied to those agents taken directly from plants or animals—from a source built up of manifold varying organs in which alone was supposed to reside "vital force," by which all substances only could be created. We no longer hold tacitly to such restriction because these very substances are often reproduced by a direct combination of the component elements or from apparent inorganic material which was once organic in nature.

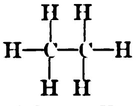
Organic carbon compounds must contain, however, carbon and hydrogen, also frequently oxygen, nitrogen, sulphur. Such elements so differ from each other in chemical and physical properties, while their combining quantities are so unrestricted, that they unite in varying proportions to yield us many hundred substances, each differing somewhat from the other.

Carbon is quadrivalent, and it is considered the graphical centre around which the other elements are to be arranged, being linked as it were by a bond dependent as to strength and degree, upon each one's atomic valence. The grouping of these carbon atoms in a molecule is quite different in the two organic series.

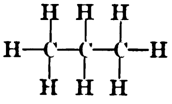
I. FATTY SERIES: Derivatives of methane, CH_4, and are linked so as to form an open chain in which the end carbon atoms are not equivalent to the others.



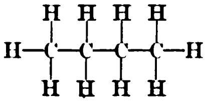
Methane CH_4



Ethane C_2H_6

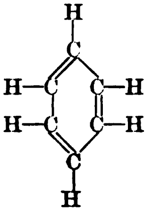


Propane C_3H_8



Butane C_4H_{10}

II. AROMATIC SERIES: Derivatives of benzene (benzol), C_6H_6, and are linked to form a close chain in which every carbon atom is the equivalent of each other. This chain (skeleton) has been assumed from the fact that as soon as six or more carbon atoms come together they tend to so unite as to form stable and permanent compounds into which only definite amounts of other elements can be introduced.



Benzene C_6H_6

Thus benzene takes up 2–4–6 atoms of hydrogen, chlorine, bromine, and under the prolonged action of HI becomes C_6H_{12}, and no more H can be imparted even be the action continued indefinitely, whereas if carbon atoms were in open chain we would get C_6H_{14}, etc. Then again, when the hexa-chloride or bromide of benzene are formed they refuse to take up any more of either element, thus showing roundness or entireness in saturation and composition.

FATTY SERIES.

I. Hydrocarbons.

These compounds contain the two elements carbon and hydrogen in various proportions, are mostly of vegetable origin, many being obtained by destructive distillation and decomposition of organic matter, and all have different boiling points by which it is possible to isolate them when carefully distilled fractionally. They are either gases, liquids or solids according to the number of carbon atoms in the molecule: 1–4=gas, 4–10–12 = liquid, and beyond this = solid; they can all be volatilized without decomposition, are colorless, usually with characteristic odor, neutral, soluble in alcohol, ether, carbon disulphide, insoluble in water, oxidize by exposure when liquids often becoming solids.

Benzinum. Benzin, $C_5H_{12}+ C_6H_{14}+$.—(Syn., Petroleum Benzin, Petroleum Ether, Benzine; Fr. Esprit (Napthé, Éther) de Pétrole, Petroléine; Ger. Benzinum Petroleï, Petroläther.)

Manufacture: Benzin (*benz*(oic) + *in*—odor somewhat benzoin-like) is a purified distillate from American petroleum, consisting of hydrocarbons, chiefly of marsh gas series and homologous compounds (C_5H_{12}, C_6H_{14}, etc.). It is a transparent, colorless, diffusible liquid, characteristic odor of petroleum, but less disagreeable, neutral, sp. gr. 0.675, boils at 50–60° C. (122–140° F.), soluble in alcohol, ether, chloroform, benzol, fixed and volatile oils, insoluble in water, very inflammable, vapors explosive. *Impurities:* Heavy hydrocarbons, pyrogenous products, sulphur compounds, benzol. Should be carefully kept cool, remote from lights or fire, in well-stoppered bottles or tin cans. Dose, ♏x–20 (.6–1.3 Cc.), on sugar, in emulsion, capsule.

PROPERTIES AND USES.—Internally—vermifuge; Externally—sedative, anæsthetic, solvent, tapeworm, scabies, prurigo, herpes, favus, sycosis, rheumatism, neuralgia, to relieve itching in urticaria, whooping-cough. Like creosote and carbolic acid to restrain fermentation in dyspepsia. Good solvent for fats, volatile oils, resins, caoutchouc, alkaloids, etc.

Petrolatum Liquidum. Liquid Petrolatum.—(Syn., Ger. Paraffinum Liquidum, Flüssiges Paraffin.)

Manufacture: Liquid petroleum (L. *petra;* Gr. πέτρα, rock, + *oleum;* ἔλαιον, oil—rock oil) is a mixture of the hydrocarbons, chiefly of marsh-gas series, obtained by distilling off the lighter and more volatile portions from petroleum (a substance found in wells, on top of streams, and oozing from the ground in Pennsylvania, New York, Ohio, etc.), and purifying the residue when it has the desired consistence. The purification consists of filtering the distillate through a long column of well-dried granular bone-black having uniform temperature of 40–50° C. (104–122° F.), or may treat crude paraffins with H_2SO_4, washing with water and solution of NaOH, then filtering through charcoal tower. It is a colorless or yellowish, oily, transparent liquid, odorless—when heated faint petroleum-odor—tasteless, sp. gr. 0.875–0.945, soluble in ether, chloroform, carbon disulphide, oil of turpentine, benzin, benzol, fixed and volatile oils; insoluble in water, alcohol. *Impurities:* Fixed oils or fats of animal or vegetable origin, resin, organic matter.

Petrolatum Molle. Soft Petrolatum, $C_{16}H_{34}$ +.—(Syn., Petrolatum, Soft Petroleum Ointment, Paraffinum Unguinosum, Adeps Petrolei, Paraffin Jelly, Soft Paraffin; Br. Paraffinum Molle; Fr. Pétroléine; Ger. Unguentum Paraffinum, Paraffin-(salbe)butter.)

Manufacture: A mixture of hydrocarbons, chiefly of marsh gas series, obtained by distilling off the lighter and more volatile portions from petroleum and purifying the residue when it has the desired melting point. This is to be dispensed when petrolatum is prescribed without further specifications. It is a fat-like mass, consistence of ointment, white or yellowish, somewhat fluorescent when yellow, transparent in thin layers, amorphous, odorless—when heated faint petroleum odor—tasteless, when melted sp. gr. 0.820–0.840, melts at 40–45° C. (104–113° F.)—otherwise like the preceding.

Petrolatum Spissum. Hard Petrolatum.—(Syn., Petrolatum, Hard Petroleum Ointment.)

Manufacture: A mixture of hydrocarbons, chiefly of marsh gas series, obtained by distilling off the lighter and more volatile portions from petroleum and purifying the residue when it has the desired melting point. It is a fat-like mass, consistence of cerate, white to yellow, sp. gr. 0.820–0.850, melts at 45–51° C. (113–125° F.)—otherwise like the preceding.

PROPERTIES AND USES.—Petrolatum in its three forms is a bland, neutral protective dressing and a substitute for fatty substances in ointments; large doses, mild laxative, soothing internal irritation and inflammation. Liquid form largely used in spray, being a good vehicle and solvent for many medicinal agents, applicable to mucous membranes of bronchi, larynx, nose, throat; also used for lubricating purposes. None become rancid and are absolutely non-irritating. Those employed in its manufacture are never troubled with chronic bronchitis or phthisis.

Allied Products:

1. *Bitumen. Bitumen.*—Official, 1820–1830. This was the crude petroleum (L. *petra*, rock, + *oleum*) as found in various places, North America, England, Scotland, West Indies, under the names naphtha, petroleum, oleum gabearium, Seneca oil, Barbadoes tar (naphtha), Trinidad pitch, etc. Was used formerly as we now use petroleum; upon distillation have residue left in still termed solid bitumen or asphaltum.

2. *Rhigolene.*—Obtained from petroleum by redistillation until a liquid is secured boiling at 18° C. (64.4° F.). It evaporates more rapidly than all known liquids (except cymogene, which boils at 0° C. (32° F.)), and when atomized gives a temperature of −9° C. (15.8° F.). Used to produce local numbness, or freezing, for minor operations by cautery, etc.

II. Alcohols.

These are hydrocarbon residues in combination with hydroxyl, OH, or hydrocarbons in which one or more hydrogen atoms have been replaced by hydroxyl, when one = monatomic, two = diatomic, three = triatomic, four = tetratomic alcohols, etc. They are hydrates of the organic radicals or residues, as thus shown:

$$\underset{\substack{\text{Methyl}\\\text{Alcohol}}}{CH_3OH}—\underset{\substack{\text{Ethyl}\\\text{Alcohol}}}{C_2H_5OH}—\underset{\substack{\text{Propyl}\\\text{Alcohol}}}{C_3H_7OH}—\underset{\substack{\text{Butyl}\\\text{Alcohol}}}{C_4H_9OH}—\underset{\substack{\text{Amyl}\\\text{Alcohol}}}{C_5H_{11}OH}—\underset{\text{Glycerin}}{C_3H_53OH}$$

Here methane, CH_4, is converted into methyl, CH_3, which combines with hydroxyl, OH, to form methyl alcohol. Ethane, C_2H_6, is converted into ethyl, C_2H_5, which unites with OH to form ethyl alcohol, etc.

1. MONATOMIC ALCOHOLS.

Alcohol. Alcohol, C_2H_5OH.—(Syn., Alcohol Vini, Spirit of Wine, Common (Ethyl) Alcohol, Spiritus Vini Rectificatissimus; Br. Spiritus Rectificatus, Rectified Spirit; Fr. Alcool, Esprit de Vin; Ger. Spiritus, (Rectificirter) Weingeist.) A liquid composed of 91 p. c. by weight, or 94 p. c. by volume of ethyl alcohol, C_2H_5OH, and 9 p. c. by weight of water.

Manufacture: 1. From ethene, C_2H_4, by adding the elements of water, which can be done by shaking with sulphuric acid—(1) $C_2H_4+H_2SO_4=C_2H_5HSO_4$. (2) $C_2H_5HSO_4+H_2O+$ distillation $=C_2H_5OH+H_2SO_4$. 2. Obtained on large scale by fermenting (with yeast, etc.), certain weak saccharine solutions containing grape sugar or glucose—$C_6H_{12}O_6+\text{ferment}=2C_2H_5OH+2CO_2$. In actual practice grain, such as barley, corn, rye, wheat, is malted or germinated. Here the starch is acted on by their contained ferment (diastase) converting it into maltose, a kind of sugar, which will be used up again if germination be allowed to go on; but prior to that resulting the sprouted grain is roasted, then infused in warm water, and the yielded maltose solution is fermented by yeast. As thus obtained the alcohol contains much water, which is removed by distillation, then macerated with calcium oxide, or anhydrous K_2CO_3, finally with freshly fused $CaCl_2$ and distilled. It is a transparent, colorless, mobile, volatile liquid, agreeable odor, characteristic burning taste, sp. gr. 0.820, boils at 78° C. (172.4° F.), miscible with water, chloroform, ether, inflammable, burns with blue flame. *Impurities:* Fusel oil, aldehyde, methyl alcohol, oak-tannin, amyl alcohol, organic impurities. Should be kept cool, remote from lights or fire, in well-closed vessels.

PREPARATIONS.—1. *Alcohol Dilutum.* Diluted Alcohol. (Syn., Proof Spirit; Br. Spiritus Tenuior; Fr. Alcool dilué; Ger. Spiritus (Dilutus) Vini Rectificatus, Verdünnter Spiritus.) A liquid composed of 41 p. c. by weight or 48.6 p. c. by volume of absolute ethyl alcohol, C_2H_5OH, and 59 p. c. water.

Manufacture: 1. Alcohol 50 Cc., distilled water 50 Cc., when mixed and cooled will measure 97.1 Cc. 2. Alcohol 41 Gm., distilled water 50 Gm. It has sp. gr. 0.938; should respond to alcohol tests, and be kept cool, remote from lights, fires, in well-closed vessels.

2. *Alcohol Absolutum.* Absolute Alcohol. (Syn., Br. Alcohol Ethylicum; Fr. Alcool Assoluto.) Ethyl alcohol containing not more than 1 p. c. by weight of water.

Manufacture: Percolate the strongest and purest alcohol through recently burnt lime, out of contact with air, redistil the percolate in vacuo. It is very hygroscopic, sp. gr. 0.795. Should respond to same characteristics and be kept under same conditions as preceding.

3. *Alcohol Deodoratum.* Deodorized Alcohol. A liquid composed of 92.5 p. c. by weight, or 95.1 p. c. by volume of ethyl alcohol, C_2H_5OH, and 7.5 p. c. by weight of water.

Manufacture: Peculiar odors are removed by distilling alcohol over 2 p. c. pure fused sodium acetate. Has same characteristics as alcohol, sp. gr. 0.816, and should be kept under same conditions as preceding. *Impurities:* Foreign odor, fusel oil, amylic alcohol, non-volatile carbonizable organic impurities.

Spiritus Frumenti. Whiskey.—(Syn., Fr. Eau de Vie de Grains; Ger. Kornbranntwein.)

Manufacture: An alcoholic liquid obtained by distilling the mash of fermented grain (usually mixtures of corn, wheat, and rye), and at least two years old; sometimes barley, oats and potatoes are used. The infusion is fermented as in alcohol, by which the saccharine matter and indirectly starch are converted into alcohol and CO_2. Now this liquid called *mash* is distilled, yielding low wines, which is in turn distilled, giving a stronger and purer spirit with less fusel oil, known as raw corn spirit or whiskey. This is now kept in barrels several years to mellow and improve in flavor by formation of compound ethers, then colored, diluted if necessary, and placed upon the market. It is an amber-colored liquid, distinctive odor and taste, sp. gr. 0.917–0.930, corresponding to alcoholic strength 44–50 p. c. by weight, or 50–58 p. c. by volume. *Impurities:* Fusel oil from grain, added sugar, glycerin, aromatic substances, oak-tannin from casks, free acid.

Spiritus Vini Gallici. Brandy.—(Syn., Spirit of French Wine; Fr. Eau de Vie, Cognac; Ger. Spiritus vini Cognac, Franzbranntwein, Branntwein.)

Manufacture: An alcoholic liquid obtained by distilling the fermented, unmodified juice of fresh grapes, and at least four years old. When the pure juices of fruits ferment and that *marc* is distilled, the distillate is brandy; hence we can have a number of named brandies dependent upon that of the fruit, as grape, apple, peach, etc. It is that of grapes, however, which is official and recognized throughout the world under the name of brandy. The best is from the French grape wines produced in the districts of Cognac, Armagnac, Bordeaux, Rochelle, etc. Most excellent brands are also distilled in Spain, Portugal, Germany, and United States—Catawba and California being considered our best. Brandy is a pale-amber-colored liquid with a distinctive odor and taste, sp. gr. 0.925–0.941, corresponding to an alcoholic strength of 39–47 p. c. by weight, or 46–55 p. c. by volume. *Impurities:* Fusel oil from grain or potato spirit, added sugar, glycerin, aromatic substances, oak-tannin from casks, free acid.

Allied Products:

1. *Vinum Album. White Wine.* See page 377.
2. *Vinum Rubrum. Red Wine.* See page 377.
3. *Vinum Xericum. Sherry Wine.*—Official, 1850–1880. This was formerly the representative selected to be used whenever white wine was desired; sp. gr. 0.978–0.995; alcoholic strength 18–22 p. c.
4. *Vinum Portense. Port Wine.*—Official, 1850–1880. This was formerly the representative selected to be used whenever red wine was desired. It is from the grape cultivated near the river Douro, in Portugal, being exported from Oporto; alcoholic strength, 18–22 p. c.

PROPERTIES AND USES.—Alcohol in its various forms is stimulant, depressant, diuretic, astringent, disinfectant, antipyretic, rubefacient, diaphoretic; stimulates heart-muscle, causing rapid and strong beats, dilates peripheral blood-vessels, stimulates brain by increasing blood supply; before meals improves appetite, during meals retards digestion by checking flow of gastric juice and increasing secretion of mucus, moderate amounts serve as a food, being oxidized during circulation; lessens oxidation of tissues. It is rapidly absorbed and eliminated by kidneys, lungs, skin and liver. Internally, debility, typhoid and other low fevers, pyæmia, pneumonia, erysipelas, after shock, fatigue, prolonged sickness, syncope, delirium, febrile stupor, tremor, eruptive and relapsing fevers, consumption, delirium tremens, poisoning by serpents, narcotics, etc., tetanus, epilepsy, reflex convulsions, as in dentition, vomiting of pregnancy, neuralgia. Externally, wounds, abscesses, aneurisms, gangrenous and other ulcers, nipple fissures, sore feet, bruises, sprains, paralyzed limbs, nasal polypi, soft tumor, varicocele. As an anæsthetic to diminish shock of surgical operation, to facilitate reduction of dislocation.

Alcohol in pharmacy is quite indispensable from its extracting and preservative powers over medicines, also useful to preserve animal tissue, and in the arts.

Whiskey is a good stimulant, does not constipate like brandy, and owing to its cheapness and purity is generally preferred. Used also as antiseptic in wounds, ulcers, etc.

Brandy, on the other hand, is more grateful to the stomach, more palatable, and is less apt than whiskey, gin, etc., to cause liver or kidney diseases. It is much used in low fevers, with milk, flavored to the patient's taste.

Poisoning: Continued abuse may produce chronic gastritis, liver cirrhosis, gout, peripheral neuritis, delirium tremens, mania, Bright's disease, predisposes phthisis, and lessens resistance to pneumonia and surgical operations. When acute, empty stomach by mustard, hypodermic apomorphine, or pump, washing it out well with strong warm coffee, plenty fresh air, inhale ammonia, give aromatic spirit of ammonia, coffee, capsicum, vinegar, hot milk, apply cold water to head, warmth to body and extremities, electricity. In delirium may quiet with chloral hydrate, potassium bromide, opium, follow with digitalis, strychnine, possibly gastric sedatives (bismuth subnitrate, carbolic acid, etc.).

Alcohol Amylicum. Amyl (Amylic) Alcohol.—Fusel Oil, $C_5H_{11}OH$. Official, 1860–1880.

Obtained when grain or potato whiskey is distilled for alcohol; the last portion of the possible distillate becomes milky, and if this milky portion be set aside, it will soon be covered with a stratum of this oily alcohol, or if the milky liquid be redistilled and that coming over at 132° C. (269° F.) be alone collected we then have comparatively the pure oil. It is an oily, colorless liquid, peculiar odor, burning, acrid taste, soluble in alcohol, insoluble in water. May contain propyl, butyl, and other alcohols, also ethers and compound ethers, sp. gr. 0.818, boils at 132° C. (269° F.), congeals at −134° C. (−209° F.). Does not take fire like alcohol, requiring 55° C. (131° F.) before beginning to burn. When treated with an oxidizing agent two atoms of H are replaced by one of O, giving $C_5H_{10}O_2$, which is amylic or valerianic acid, this being the method of obtaining nearly all of this acid. It is poisonous, and must be given cautiously as a nervous stimulant, in phthisis; chiefly used to make amyl nitrite, fruit-essences (ether), sodium valerianate, and valerianic acid.

2. TRIATOMIC ALCOHOLS.

Glycerinum. Glycerin, $C_3H_5(OH)_3$.—(Syn., Glycerine, Glycerina; Fr. Glycérine; Ger. Oelsüss.)

Manufacture: Glycerin (Gr. γλυκερός, γλυκύς, sweet—its taste) exists in combination with the fatty acids, forming compound ethers (= fats: animal, vegetable, liquid, and solid), and when these are acted upon (decomposed) by an alkali we have glycerin liberated, while the alkali unites with the fat-acids forming soluble soap.

$$C_3H_5 3C_{18}H_{33}O_2 + 3NaOH = C_3H_5 3OH + 3NaC_{18}H_{33}O_2.$$

Glyceryl Oleate (Olive Oil)	Glyceryl Hydrate (Glycerin)	Sodium Oleate (Hard Soap)

It is a clear, colorless liquid containing not less than 95 p. c. of absolute glycerin, $C_3H_5(OH)_3$, syrupy consistence, oily to touch, odorless, sweet, warm taste, hygroscopic, sp. gr. 1.250, soluble in water, alcohol; insoluble in ether, chloroform, fixed and volatile oils, boils at 165° C. (329° F.), and is finally decomposed and dissipated, vaporizes from aqueous solution at 100° C. (212° F.). *Impurities:* Dextrin, sugar, metals, calcium salts, oxalic acid, sulphuric acid, fatty acids, carbonized impurities, chlorides. Dose, ♏x–60 (.6–4 Cc.).

PREPARATION.—1. *Suppositoria Glycerini.* Suppositories of Glycerin. (Syn., Fr. Suppositoires de Glycerin; Ger. Glycerin Stuhlzäpfchen.)

Manufacture: Dissolve sodium carbonate 3 Gm. in glycerin 60 Gm. by heat, add stearic acid 5 Gm., heat until all carbon dioxide has escaped, pour into moulds, cool, wrap in tin-foil.

PROPERTIES AND USES.—Irritant, laxative, solvent, emollient when diluted. Externally, skin diseases, eczema, herpes, lepra, pityriasis, psoriasis, lichen, prurigo; in lotion for incrusted lupus, chapped skin, excoriated surfaces, fissures of anus and nipple, wounds, boils, carbuncles, abscesses, coryza, pharyngitis, otorrhœa; allays itching, dryness of mouth, deafness. Internally, phthisis, diabetes, typhoid fever, constipation, in enemas or suppositories, ascarides, dysentery, hemorrhoids, leucorrhœa. In pharmacy as a solvent (iodine, bromine, tannin, alkaloids, salicin, alkalies, etc.), vehicle, excipient, preservative, to keep extracts soft and from moulding, etc. Suppositories—for constipation, acting as mechanical irritants; 1 applied night or morning.

Spiritus Glonoini. Spirit of Glonoin, $C_3H_5(NO_3)_3$.—(Syn., Spirit (Solution) of Nitroglycerin, Solution of Trinitrin; Br. Liquor (Trinitrini) Nitroglycerini.)

Manufacture: Nitroglycerin (Glonoin—*gl*(ycerin) + *o*(xygen) + *n*(itr)-*o*(gen) + *in*) is prepared by gradually adding dehydrated glycerin to nitric acid, or better, a mixture of nitric and sulphuric acids, the radical NO_2 replacing hydrogen in the glycerin—$C_3H_5(OH)_3 + 3HNO_3 = C_3H_5(NO_3)_3 + 3H_2O$. It separates as an oily layer, when it is washed with water and dilute soda solution to remove all acid.

The official spirit is an alcoholic solution of this glonoin (glyceryl or propenyl trinitrate, nitroglycerin, or trinitrin), $C_3H_5(NO_3)_3$, containing 1 p. c. by weight. It is a clear, colorless liquid, alcoholic odor and taste, a very little often produces headache when tested or applied to the skin, sp. gr. 0.826–0.832. Should be kept cool, remote from lights or fires, transported in well-stoppered tin cans, as dangerous explosions may occur when spilled by carelessly handling. Dose, ♏j–3 (.06–.2 Cc.).

PROPERTIES AND USES.—Like amyl nitrite (or any nitrite), except its action is not quite so prompt, but is more persistent. Angina pectoris, asthma, convulsions, tetanus, collapse, illuminating gas, strychnine and chloroform poisoning, cardiac stimulant. If taken early, often wards off the attack of cardiac pain and epileptic seizures. It is thought that in undergoing alkaline decomposition in the system the nitrite is formed, which yields nascent nitrous acid. Can be given by mouth or hypodermically.

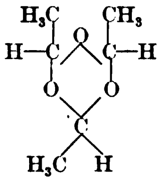
III. Aldehydes. Halogen Derivatives.

These are obtained from alcohol by removing two atoms of hydrogen, hence name *al*(cohol) + *dehyd*(rogenatus)—*de*, from, + hydrogen; *i. e.*, alcohol deprived of hydrogen). They are chemically between alcohols and acids, and may be considered unsaturated hydrocarbons attached to COH, thus:

$$(1)\ \underset{\text{Ethane}}{C_2H_6} - H = \underset{\substack{\text{Unsaturated}\\ \text{Hydrocarbon}}}{C_2H_5} \qquad (2)\ C_2H_5 + OH = \underset{\text{Ethyl Alcohol}}{C_2H_5OH} \qquad (3)\ \underset{\substack{\text{Ethyl}\\ \text{Alcohol}}}{C_2H_6O} - H_2 = \underset{\substack{\text{Acetic}\\ \text{Aldehyde}}}{C_2H_4O}.$$

The hydrogen can be removed by oxidation when one atom of outside oxygen combines with two atoms of alcoholic hydrogen, forming one molecule of water and the aldehyde, which by further oxidation goes into its corresponding acid.

Paraldehydum. Paraldehyde, $C_6H_{12}O_3$ =



(Syn., Ger. Paraldehyd.) A polymeric form of ethylic aldehyde, C_2H_4O.

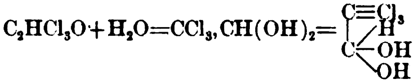
Manufacture: Paraldehyde (Gr. παρά, resembling +) is obtained usually by passing hydrochloric acid gas into aldehyde, or by adding to ordinary (ethylic) aldehyde a small quantity of either H_2SO_4—HCl —$ZnCl_2$ or $COCl_2$ (carbonyl chloride); the temperature of the mixture rises, and almost a complete conversion into paraldehyde takes place. It is a colorless, transparent liquid, characteristic, but not unpleasant, pungent odor, burning, cooling taste, soluble in alcohol, ether, fixed and volatile oils, 8.5 parts water; crystallizes at 0° C. (32° F.) ($3C_2H_4O = C_6H_{12}O_3$), becoming liquid again at 10.5° C. (51° F.).

Impurities: Aldehyde from fusel oil, amylic alcohol, hydrochloric acid, sulphuric acid, free acid. Should be kept cool, in well-stoppered, dark-amber bottles. Dose, ♏xv–60 (1–4 Cc.), largely diluted with syrup and flavored with tincture of orange-peel or some aromatic, as the taste is disagreeable.

PROPERTIES.—Soporific, hypnotic, antiseptic. Excessive doses weaken heart-action. Kills by paralysis of the respiratory centre, moderate doses cause several hours of refreshing, dreamless sleep, without any unpleasant after-effects. May create "*paraldehyde-habit,*" emaciation, etc.

USES.—Same troubles as chloral hydrate—insomnia from mental strain, insanity, mania, melancholia, delirium tremens, cardiac troubles, allays itching in jaundice, vomiting in sick headache, pregnancy and irritable ovary, very good in strychnine-poisoning, morphine-habit, often produces erythematous rash.

Chloral Hydras. Chloral Hydrate.



$$C_2HCl_3O+H_2O=CCl_3,CH(OH)_2=\begin{array}{l}C\equiv Cl_3\\ |\diagup H\\ C-OH\\ \;\diagdown OH\end{array}$$

(Syn., Chloral, Aldehydum Trichloratum, Hydrous Chloral, Trichloraldehyde Hydrate; Fr. Hydrate de Chloral; Ger. Chloralum Hydratum, Chloral Hydrat.) A crystalline solid composed of trichloraldehyde or chloral with one molecule of water.

Manufacture: Chloral (*chlor*(ine) + *al*(cohol)) is acetic aldehyde, C_2H_4O, in which three hydrogen atoms have been replaced by three chlorine atoms, and is made, as the name would suggest, by passing dry chlorine gas into anhydrous alcohol until saturated, which requires from a few hours to many weeks, according to amount of alcohol operated upon; this saturated liquid separates into two layers, the lower being removed, is shaken with three volumes H_2SO_4 and distilled; mix distillate with CaO, and again distil when that coming over at 94–99° C. (201–210° F.) is collected, mixed with water and allowed to crystallize, as chloral hydrate.

$$(1)\ C_2H_6O+2Cl=C_2H_4O+2HCl,\quad (2)\ C_2H_4O+6Cl=C_2HCl_3O+3HCl.$$

It is in colorless, transparent, rhomboidal crystals, odor aromatic, penetrating, acrid; taste bitter, caustic, volatile, freely soluble in water, alcohol, ether, chloroform, fixed and volatile oils; liquefies when triturated with equal quantity of either camphor, menthol, thymol or carbolic acid, melts at 58° C. (136.4° F.) into liquid having sp. gr. 1.575. Caustic alkalies and alkaline earths decompose it into chloroform and formate of the alkali used. *Impurities:* Hydrochloric acid, chlorides, chloral alcoholate. Should be kept cool, dark, in glass-stoppered bottles. Dose, gr. 5–20 (.3–1.3 Gm.), not safe to exceed this, on account of its possible deception due to cumulative tendency, etc.

PROPERTIES.—Externally, antiseptic, vesicant, irritant, anodyne. Internally, soporific, hypnotic, gastric irritant, general depressant (vaso-motor centre, also heart becomes slow, feeble, irregular, stopping in diastole), produces sleep quickly, is certain and has no bad after-effects, circulates in the blood unchanged, may be decomposed finally if urine is alkaline.

USES.—Externally, mixed with camphor, menthol, etc., anodyne in neuralgia, caries of teeth, for toothache, foul sores, ulcers, fetor of feet, chapped nipples, erectile tumor, gonorrhœa, diphtheria, night-sweats. Internally, nervous insomnia from overwork, worry, etc., acute fevers, active congestion of brain, cerebral inflammation, mania, delirium tremens, tetanus, hysteria, chorea, epilepsy, local spasms, asthma, strangulated hernia, spasm of the glottis, spasmodic croup, hiccough, incontinence of urine, insanity, to relieve pain, nervous headache, angina pectoris, convulsions, whooping-cough, dysentery, typhoid fever, strychnine, hyoscine, and calabar bean poisoning.

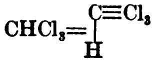
Poisoning: Resembles somewhat opium; have deep coma, weak, irregular, slow pulse, slow respiration, lividity, no reflex movements, skin cold, temperature below normal. Give emetics or wash out stomach, cold to head and neck; abundant fresh air, cataplasms, hot bottles, blankets, massage and friction to increase heat; keep awake with coffee, caffeine, galvanism, flagellation, hypodermic strychnine or picrotoxin, inhale amyl nitrite to stimulate heart, artificial respiration.

Chloral habit (*toxemia, chloralism*) is soon acquired and usually results in voluble speech, injected eyes, gastro-intestinal irritation, erythematous eruptions, dyspnœa, general weakness and permanent mental disturbance. To cure must withdraw drug, use hygienic and medicinal tonics with cannabis indica.

Incompatibles: Alkalies, lime water, atropine, strychnine, external heat.

Synergists: Hypnotics, morphine (also lessens heart depression).

Chloroformum. Chloroform.



$$CHCl_3=\underset{\displaystyle H}{\underset{|}{C}}\equiv Cl_3$$

(Syn., Chloroformum Purificatum, Formylum Trichloratum, Terchloride of Formyl, Di-chlor-methyl Chloride; Fr. Chloroforme (pur); Ger. Chloroformium, Chloroform.) A liquid consisting of 99–99.4 p. c. by weight of absolute chloroform and 1–0.6 p. c. alcohol.

Manufacture: Chloroform (*chlor*(ine) + *form*(yl)) is the trichloride of methane, or methyl, CH_4, where three hydrogen atoms are removed and replaced by three chlorine atoms. In actual practice, water 24 parts, alcohol 1, chlorinated lime 6, are put into a still and heated to 50° C. (122° F.), when chloroform and alcohol distil over, the heat from chemical reaction being sufficient to continue the process; to remove any undecomposed alcohol shake distillate with water. Here chlorine of the lime converts alcohol into aldehyde, then into chloral, which is at once decomposed by the inherently formed alkali—calcium hydrate, into chloroform and calcium formate, $Ca(CHO_2)_2$, hence the various names. Calcium formate is decomposed by another portion of chlorinated lime into $CaCO_3$, $CaCl_2$, and H_2O; thus—$2C_2H_5OH + 10CaOCl_2 = 2CHCl_3 + 7CaCl_2 + 2CaCO_3 + Ca(OH)_2 + 4H_2O$. This process has now given way to that of acetone. Here acetone, which is a liquid product from the destructive distillation of calcium acetate (derived from dry distillation of wood), and chlorinated lime are distilled together; thus—$2C_3H_6O + 6CaOCl_2 = 2CHCl_3 + Ca(C_2H_3O_2)_2 + 2Ca(OH)_2 + 3CaCl_2$. Chloroform is a heavy, clear, colorless, mobile, diffusible liquid, characteristic ethereal odor, burning, sweet taste, soluble in alcohol, ether, 200 parts water, sp. gr. 1.490, volatile, boils at 60° C. (140° F.), non-inflammable, but its heated vapor burns with green flame. *Impurities:* Chlorides, free chlorine, decomposable hydrocarbon products (by H_2SO_4, dark), chlorinated compounds, non-volatile compounds. Should be kept cool, dark, in dark-amber, glass-stoppered bottles.

Purification: When chloroform contains any of the above it should be purified by taking 400 Gm. and shaking with H_2SO_4 80 Gm. occasionally for twenty-four hours, avoiding exposure to bright daylight; this chars and removes hydrocarbons; now separate lighter chloroform-layer and shake it with dried Na_2CO_3 20 Gm. to free from acid, transfer chloroform to dry retort, add deodorized alcohol 4 Cc., and distil at 67° C. (153° F.) until the distillate measures 255 Cc. Dose, ♏ij–20 (.13–1.3 Cc.).

PREPARATIONS.—1. *Aqua Chloroformi.* Chloroform Water. (Syn., Fr. Eau de Chloroforme; Ger. Chloroformwasser.)

Manufacture: Chloroform 4 Cc., distilled water 750 Cc. or thereabouts, shake in a two-pint (1 L.), stoppered bottle until dissolved. Must always have saturated solution, with chloroform in slight excess. Dose, ʒj–4 (4–15 Cc.).

2. *Emulsum Chloroformi.* Emulsion of Chloroform. (Syn., Mistura Chloroformi, Chloroform Mixture, Emulsio Chloroformi; Fr. Emulsion de Chloroforme; Ger. Chloroform-Emulsion.)

Manufacture: Put tragacanth 1.5 Gm. into a dry bottle, add chloroform 4 Cc., shake thoroughly, add water 25 Cc., shake, add in portions expressed oil of almond 6 Cc., shaking after each addition, add water q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

3. *Linimentum Chloroformi.* Chloroform Liniment. (Syn., Fr. Liniment au Chloroforme; Ger. Chloroform-Liniment.)

Manufacture: Mix by agitation chloroform 30 Cc. and soap liniment 70 Cc. Use externally.

4. *Spiritus Chloroformi.* Spirit of Chloroform. (Syn., Br. Chloric Ether, Spirit of Chloric Ether; Fr. Alcoolat (Alcoolé) de Chloroforme; Ger. Chloroform-spiritus.)

Manufacture: Mix chloroform 6 Cc. and alcohol 94 Cc. Dose, ʒss–1 (2–4 Cc.).

PROPERTIES.—Internally, irritant, anæsthetic locally, astringent, stimulant, narcotic. The *first stage* is that of general stimulation, excited imagination, feeling of warmth and comfort, mind incoherent, confused, pupils dilated, may laugh, kick, fight, vomit, or cry unconsciously, pulse increases, heart and great vessels throb, may have choking, cessation of breathing, flushed face; the *second stage* is that of depression, complete unconsciousness, sees, hears and feels nothing; *third stage* is that of total abolition of reflex excitability, may pass urine and fæces involuntarily. Externally, irritant, vesicant, anæsthetic. Should not be given to those having lung trouble, fatty or feeble hearts, or to the very old.

Uses.—Internally or inhalation, toothache, dyspepsia, setting fractured bones, dislocations, strangulated hernias, hiccough, chorea, hysteria, whooping-cough, asthma, angina pectoris, biliary and nephritic colic, tetanus, hydrophobia, tic douloureux, pregnant vomit, labor, painter's colic, dysmenorrhœa, spasms of bladder and rectum, gastric ulcer, colic, calculi, convulsions, fevers. Externally, toothache, headache, rheumatism, neuralgia, dysmenorrhœa, painful parturition, swelled testicle, hemorrhoids, hemorrhage, tænia.

When inhaled must be with abundance (95 p. c.) of air. It requires usually 2–3 minutes to get insensibility (much more quickly than with ether), which lasts only 5–10 minutes, unless persisted in, or morphine injected, which latter prolongs the effect considerably. One fluiddrachm (250 drops; 4 Cc.) will suffice for each inhalation, though more at the initial is often required.

Poisoning: If swallowed, empty the stomach by pump, siphon, or emetics, give enema of hot coffee, large draughts of water containing sodium bicarbonate, and treat as if inhaled, thus: Lower the head, pull forward the tongue to admit air, artificial respiration for an hour, electricity, hot and cold douche, inhale amyl nitrite, ether, ammonia, give brandy, atropine, strychnine. One death occurs in every 3,000 inhalations. In recovery, the muscles regain first involuntary powers, sensibility comes next, and last consciousness, which may require hours for perfect equilibrium. There is never any remembrance of the occurrences during the insensibility, even the nausea, vomiting, etc., is the result of involition.

Incompatibles: Weak spirits, glycerin, stimulants, galvanism.

Synergists: Anæsthetics, alcohol, chloral hydrate, morphine, etc.

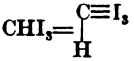
Allied Product:

1. *Chloretone,* $C_4H_7OCl_3$.—Obtained by the interaction of chloroform, acetone and an alkali, and occurs in white crystals, soluble in alcohol, largely in warm water, sparingly in cold, sublimes at body temperature into white glistening needles, stable in presence of diluted acids and alkalies; permanent, non-toxic, non-irritating.

Properties and Uses.—Hypnotic, analgesic, local anæsthetic, anodyne, sedative, antiseptic; resembles cocaine but has less toxic effects upon the heart, slightly lessens pulse rate; considered superior to cocaine, beta-eucaine, chloral hydrate, sulphonal, trional, etc., for insomnia, gastric carcinoma, gastritis, seasickness, pregnant vomit, nausea, wounds, cuts, abrasions, minor operations. Dose, gr. 5–15 (.3–1 Gm.); apply locally the powder or saturated aqueous solution.

Chloroform made by the acetone process has been sold under this same name, with the recommendation of it not reducing the force of cardiac systole, or lowering blood-pressure.

Iodoformum. Iodoform.



$$CHI_3 = \overset{C \equiv I_3}{\underset{H}{|}}$$

(Syn., Diiodomethyl-iodide, Carboneum Jodatum, Ioduretum Carbonici, Triiodomethane; Fr. Iodure de Formyle, Iodoforme; Ger. Iodoformium, Jodoform.)

Manufacture: Iodoform (*iod*(ine) + (chlor)*oform*) is the triiodide of methane, or methyl (CH_4), where three hydrogen atoms are removed and replaced by three iodine atoms similar to chloroform. In actual practice made by heating together alcohol, iodine, and potassium bicarbonate—$C_2H_5OH + 4I_2 + 2KHCO_3 +$ heat in a closed vessel $= 2CHI_3 + 2KI + 3H_2O + 2CO_2$. In this process K_2CO_3 or KOH can be substituted for $KHCO_3$. It is in small, lemon-yellow, lustrous, hexagonal crystals; odor peculiar, penetrating, persistent, resembling saffron and iodine; taste unpleasant, sweetish, iodine-like; contains more than 90 p. c. iodine; sp. gr. 2,000; soluble in chloroform, benzin, fixed and volatile oils, 52 parts alcohol, slightly in water. *Impurities:* Fixed substances, soluble yellow coloring matters, picric acid, free acid, soluble iodides. Should be kept cool, dark, in well-stoppered bottles. Dose, gr. 1–3 (.06–.2 Gm.), in pill; applied externally as ointment, in collodion, alcohol, liniments, suppositories, gauzes, etc., or in dry powder.

PREPARATION.—1. *Unguentum Iodoformi.* Iodoform Ointment. (Syn., Fr. Pommade d'Iodoforme; Ger. Jodoformsalbe.)

Manufacture: 10 p. c. Rub iodoform 10 Gm. with benzoinated lard 90 Gm., gradually added until thoroughly mixed. Should be made fresh when required.

PROPERTIES.—Internally, increases appetite, narcotic, eliminated by secretions, chiefly in urine, as iodine, iodides and iodates. Externally, antiseptic, disinfectant, analgesic, local stimulant, anæsthetic.

USES.—Externally, ulcers, sores, wounds, tuberculous and syphilitic ulcers, cancer, metritis, endometritis, swollen glands, pleural effusions, also of pericardium, inflamed joints, diphtheria, chronic cystitis, goitre, gonorrhœa, buboes, ozæna, ulcer of tongue, chronic otorrhœa, ringworm of scalp, purulent ophthalmia, ulcerated eyelids, corneal ulcers, hemorrhoids, lupus, pruritus of vagina and testes, skin diseases, eczema, psoriasis, prurigo, erysipelas, ulcers of larynx, nasal catarrh, gangrene, vaginismus, neuralgia, heart-trouble, orchitis, carious teeth, boils, carbuncles, scrofula. The odor can be modified by the addition of some aromatic substance as vanillin, musk, oils of bergamot, lavender, peppermint, sassafras, etc., balsam of Peru, thymol, eucalyptol, etc.

Poisoning: Usually have symptoms of meningitis—headache, stupor, gastro-intestinal irritation, melancholia, hallucinations, contracted pupils, erythema, delirium, rapid pulse, death. Give potassium bromide, which dissolves the iodine compound, lemonade, potassium acetate solutions, stimulants, diaphoretics, diuretics, warm sponge bath, small repeated doses of tincture of opium, large doses of potassium bicarbonate, diluents freely.

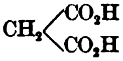
Incompatibles: Mercuric chloride, etc.

IV. Acids.

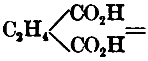
Acids are obtained from hydrocarbons by removing a hydrogen atom and substituting for it the univalent group carboxyl, CO_2H, or from alcohols by replacing two hydrogen atoms with one oxygen atom, thus:

CH_4	CH_3CO_2H	C_2H_6	$C_2H_5CO_2H$
Methane	Acetic Acid	Ethane	Propionic Acid

When this substitution is one atom for one carboxyl we have monobasic acids; when two hydrogen are replaced by two carboxyl have dibasic acids, etc., thus:



$CH_2\langle^{CO_2H}_{CO_2H}$ = Malonic Acid.



$C_2H_4\langle^{CO_2H}_{CO_2H}$ = Succinic Acid, etc.

1. MONOBASIC FATTY ACIDS.

Acidum Aceticum. Acetic Acid, $HC_2H_3O_2 = CH_3COOH$.—(Syn., Fr. Acide acétique; Ger. Essigsäure.) A liquid composed of 36 p. c. by weight of absolute acetic acid, $HC_2H_3O_2$, and 64 p. c. water.

Manufacture: Wood, preferably white oak (*Quercus alba*), is dry distilled at 205° C. (401° F.) for seven days; gases, such as acetylene, C_2H_2, ethylene, C_2H_4, propene, C_3H_6, marsh gas, CH_4, carbon dioxide, CO_2, etc., escape; the wood losing one-half in weight, becoming walnut-colored, but retaining original structure and elementary composition, remains in the retort as does also a dark liquid, in two strata, at the bottom; the upper—aqueous, slightly colored, amounts to about 30 p. c. of the weight of original wood taken, and is crude wood vinegar or pyroligneous acid, containing also methyl alcohol, acetone, guaiacol, pyrocatechin, furfurol, etc., the latter—oily, is tarry and contains creosote, etc. The upper liquid is distilled, the first 10 p.c. going over being alcohol, acetone, and the next 75–80 p. c. a yellow liquid, *acetum pyrolignosum rectificatum*, P. G., with about 6 p. c. acetic acid. This is now boiled with milk of lime, or neutralized with soda ash or sodium carbonate, giving calcium or sodium acetate in solution (if milk of lime used must double decompose with sodium sulphate to get sodium acetate), filter solution, concentrate, crystallize, and distil this with H_2SO_4, when we get acetic acid of desired strength, thus—$NaC_2H_3O_2 + H_2SO_4 = HC_2H_3O_2 + NaHSO_4$. It is a clear, colorless liquid, strong vinegar-odor, acid taste, sp. gr. 1.048, miscible with water, alcohol, volatile. *Assay:* Neutralize 6 Gm., requires 36 Cc. normal potassa V. S. (each Cc. of V. S. corresponding to 1 p. c. absolute acid), phenolphtalein indicator. *Impurities:* Copper, lead, H_2SO_4, HCl, H_2SO_3, formic acid, empyreumatic substances.

PREPARATION.—1. *Acidum Aceticum Dilutum.* Diluted Acetic Acid. (Syn., Fr. Acide acétique dilué; Ger. Acetum Purum (Destillatum), Verdünnte Essigsäure, Reiner Essig.)

Manufacture: Mix acetic acid 100 Gm. with distilled water 500 Gm. It contains 6 p. c. by weight of absolute acetic acid, sp. gr. 1.008. *Assay:* Neutralize 24 Gm. requires 24 Cc. potassa V. S. (each Cc. of V. S. corresponding to 0.25 p. c. absolute acid), phenolphtalein indicator. Dose, ʒj–4 (4–15 Cc.).

Much of the weaker acetic acid is the result of weak alcohol or aldehyde oxidation, made by allowing dil. alcohol (8–10 p. c.) to trickle downward through wood shavings, packed in barrels, so as to afford free circulation of air, the percolate being returned so often as (four times) required for complete oxidation. The presence of the growth "mother of vinegar" (*Mycode'rma ace'ti*) facilitates greatly the conversion—$C_2H_5OH+O_2=C_2H_3O,OH+H_2O$. This is usually called vinegar, and contains about 4–5 p. c. pure acetic acid.

Acidum Aceticum Glaciale. Glacial Acetic Acid, $HC_2H_3O_2$.—(Syn., Br. Acidum Aceticum (Concentratum), Acetum Glaciale; Fr. Acide acétique (concentré) Crystallizable, Esprit de Vinaigre, Acetum glacialé, Vinaigre Glacial; Ger. Essigsäure, Eisessig.)

Manufacture: Sodium acetate 13.5 parts, deprived of water of crystallization (then making 8.25 parts) is distilled with H_2SO_4, 9.5 to 10 parts, when the distillate can be evaporated and crystallized at 0° C. (32° F.)—$NaC_2H_3O_2+H_2SO_4=HC_2H_3O_2+NaHSO_4$. Every 136 parts cryst. sodium acetate yields 60 parts acetic acid. It is a clear, colorless liquid, being almost absolute acetic acid, strong vinegar-odor, pungent, acrid taste, sp. gr. 1.058, corresponding to 99 p. c. absolute acid. *Assay:* Neutralize 3 Gm. requires 49.5 Cc. potassa V. S. (each Cc. of V. S. corresponding to 2 p. c. absolute acid), phenolphtalein indicator. *Impurities:* As found in market may be adulterated with mineral acids (H_2SO_4, HCl), arsenic, lead, zinc, copper, tin, wood vinegar, coloring matter, capsicum.

PROPERTIES.—Corrosive, irritant, refrigerant, astringent.

USES.—Vapors applied to nostrils as an excitant in syncope, asphyxia, headache. Glacial Acid—mostly applied externally to warts, corns, for blistering, favus, lichen, prurigo, psoriasis, cancer, nasal polypus.

Allied Products:

1. *Acetum. Vinegar.*—Official, 1820–1880. Obtained by the acetous fermentation of infusions of malted and unmalted grain, or of various fruit juices.

2. *Acidum Aceticum Empyreumaticum. Pyroligneous Acid.*—Official, 1830–1840. (Syn., Fr. Acide acétique du bois, Acide pyroacétique (pyroligneux); Ger. Holzessigsäure.) Obtained by the destructive distillation of wood; yield of acetic acid 6–8–9 p. c.

Acidum Oleicum. Oleic Acid, $HC_{18}H_{33}O_2$.—(Syn., Acidum (Oleinicum) Elainicum, Elaic Acid; Fr. Acide oléique; Ger. Oleinsäure, Oelsäure.) An organic acid prepared in a sufficiently pure condition by cooling commercial oleic acid to about 5° C. (41° F.), then separating and preserving liquid portion.

Manufacture: Boil almond or olive oil (mainly oleate of glyceryl) with KOH, which yields potassium oleate (soap); decompose this with hydrochloric or tartaric acid; collect oily layer which separates, and heat with litharge 100° C. (212° F.) for several hours, thus forming lead oleate, palmitate, and stearate; the oleate is dissolved out by ether or benzin, and lead precipitated by HCl; can, however, saponify oils direct with litharge, dissolve lead oleate in benzin, add HCl, filter from lead, evaporate benzin, wash resulting oleic acid with water. It is a yellow or brownish-yellow, oily liquid, peculiar lard odor and taste, darkens by age, sp. gr. 0.900, soluble in alcohol, chloroform, benzene, benzin, oil of turpentine, fixed and volatile oils, solidifies at 4° C. (39° F.). *Impurities:* Fixed oils, palmitic and stearic acids.

PROPERTIES AND USES.—Important, since it is a solvent for medicines to be applied by inunction and the base of official oleates, which do not decompose (becoming rancid, etc.) like ointments, and enter the skin deeper without any irritation.

Oleate of Mercury—good in skin diseases, sycosis, chloasma, pediculi, syphilitic affections, thinning and loss of hair. Oleates of zinc and veratrine are very useful, as are also several unofficial oleates.

Acidum Stearicum. Stearic Acid, $HC_{18}H_{35}O_2$.—(Syn., Fr. Acide stéarique; Ger. Stearinsäure.) An organic acid, in its commercial form more or less impure, usually obtained from the more solid fats, chiefly tallow.

Manufacture: This exists as the glyceride in all solid animal fats and in many oils, and is prepared from tallow by boiling with NaOH or K_2CO_3; this forms sodium stearate (soap) and liberates glycerin—$C_3H_5(C_{18}H_{35}O_2)_3 + 3NaOH = C_3H_5(OH)_3 + 3NaC_{18}H_{35}O_2$. The soap is decomposed by heating with water and H_2SO_4 (or HCl), thus setting free the fatty acids, which, floating on the surface, are removed and purified with hot alcohol, when cool stearic acid separates (from oleic) in crystals. It is a hard, white, glossy solid, odorless, tasteless, permanent, soluble in ether, 45 parts alcohol, insoluble in water, melts at 56–69° C. (132.8–156.6° F.). *Impurities:* Undecomposed fat, etc.

PREPARATION.—1. *Suppositoria Glycerini,* 7¾ gr. (.5 Gm.) in each.

PROPERTIES AND USES.—Mainly in manufacturing glycerin suppositories, and as zinc and copper stearates, for various skin diseases.

2. DIBASIC FATTY ACIDS.

(These have two hydrogen atoms replaceable by metals.)

Acidum Oxalicum. Oxalic Acid, $H_2C_2O_4,2H_2O$.—(Syn., Fr. Acide oxalique ou carboneux; Ger. Oxalsäure, Kleesäure.) Composed of two carboxyl groups, CO_2H+CO_2H.

Manufacture: Found in many plants (*Oxalis, Rumex, Rheum,* etc.), as acid calcium or potassium oxalates, also in urine as calcium oxalate.

Can be made by oxidizing many organic substances, fats, sugars, starch, etc., with nitric acid, or other strong oxidizing agents. Produced on the large scale by heating sawdust with KOH and NaOH at 250° C. (482° F.), when oxalate of these is formed, now add calcium hydroxide to alkaline oxalate solution, giving insoluble calcium oxalate, which is decomposed by H_2SO_4 or HCl. It occurs in large transparent, colorless crystals, soluble in water, alcohol, very poisonous, heated highly splits into H_2O, CO_2, CO.

Fig. 438.

Oxalic acid crystal.

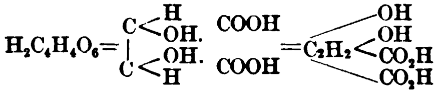
Preparation.—1. *Decinormal Oxalic Acid Volumetric Solution.*

Manufacture: Pure oxalic acid 6.285 Gm., distilled water q. s. 1,000 Cc.

Properties and Uses.—Poisonous, reducing agent, decolorizes permanganate solutions, precipitates gold and platinum solutions, removes iron stains from linen, paper, fabrics. Acid potassium oxalates under names *salt of sorrel*, *salt of lemon*, are also much used in decolorizing tissues of various kinds. Owing to close resemblance of oxalic acid to Epsom salt, serious mistakes have inadvertently been made by taking the former for the latter.

Poisoning: Have vomiting, burning pain, constriction of throat and stomach, collapse, drowsiness, stupor, dark-colored discharges, death. Empty stomach, then give powdered chalk, whiting or wall-plaster in water, slaked lime (lime water), dried whitewash, to form insoluble oxalate, hot fomentations to loins, enema, oil, abundant water, opium.

Acidum Tartaricum. Tartaric Acid.



$$H_2C_4H_4O_6 = \begin{array}{l} C<^{H}_{OH.} \\ | \\ C<^{OH.}_{H} \end{array} \begin{array}{l} COOH \\ \\ COOH \end{array} = C_2H_2 < \begin{array}{l} OH \\ OH \\ CO_2H \\ CO_2H \end{array}$$

(Syn., Sal Essentiali Tartari, Dioxysuccinic Acid; Fr. Acide du Tartre, Acide tartrique; Ger. Weinsäure, Weinsteinsäure.) An organic acid usually prepared from argol.

Manufacture: Tartaric acid is found in vegetables and fruits, free and combined with potassium or calcium. The grape contains most, having it in the form of potassium acid tartrate, crude tartar, or argol. This substance is soluble in an aqueous saccharine solution, as of fresh grape juice; but when the weak saccharine solution begins to ferment alcohol is formed in which this argol is not soluble, consequently it is precipitated to the bottom. While this contains mostly potassium acid tartrate, it also has some calcium tartrate, coloring matter, etc. It is powdered, boiled in water, neutralized with chalk (adding until effervescence ceases), and decomposed with calcium chloride; the resulting calcium tartrate is washed and boiled with sulphuric acid, thus leaving tartaric acid in solution, from which it is crystallized. Thus:

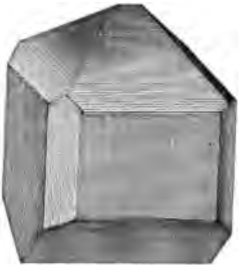
$$(1)\ \underset{\text{Potassium Acid Tartrate}}{2KHC_4H_4O_6} + CaCO_3 = \underset{\text{Calcium Tartrate}}{CaC_4H_4O_6} + \underset{\text{Potassium Tartrate}}{K_2C_4H_4O_6} + H_2O + CO_2$$

$$(2)\ K_2C_4H_4O_6 + CaCl_2 = CaC_4H_4O_6 + 2KCl$$

$$(3)\ CaC_4H_4O_6 + H_2SO_4 = H_2C_4H_4O_6 + CaSO_4.$$

It is in colorless, translucent, monoclinic prisms, or white powder, odorless, acid taste, permanent, soluble in 0.8 part water, 2.5 alcohol, high heat decomposes it with burning sugar odor. Its graphic formula represents hydrogen in hydroxyl replaceable by alcohol radical, not by metals, and hydrogen in carboxyl replaceable by metals alone. *Assay:* 3.75 Gm. should require 50 Cc. potassa V. S. for neutralization (each Cc. of V. S. corresponding to 2 p. c. of pure acid), phenolphtalein indicator. *Impurities:* Iron, lead, copper, calcium, sulphuric, oxalic, and uric acids. Dose, gr. 5–30 (.3–2 Gm.).

FIG. 439.



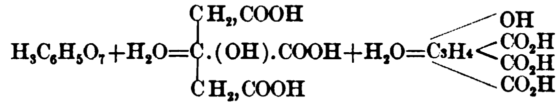
Tartaric acid crystal.

PROPERTIES AND USES. — Owing to its greater cheapness is much used for citric acid in making lemonade, effervescing drinks, powders, etc. When mixed with sugar, mucilage, aromatics, etc., it serves to moisten the throat in pharyngitis, pulmonary catarrh, to dissolve false membranes of diphtheria, correct fetor of feet, etc.

3. TRIBASIC FATTY ACIDS.

(These acids have three hydrogen atoms replaceable by metals.)

Acidum Citricum. Citric Acid.



$$H_3C_6H_5O_7 + H_2O = \begin{matrix} CH_2,COOH \\ | \\ C.(OH).COOH \\ | \\ CH_2,COOH \end{matrix} + H_2O = C_3H_4 \begin{matrix} OH \\ CO_2H \\ CO_2H \\ CO_2H \end{matrix}$$

(Syn., Acidum Citri—Limonis—Limonum—Limonorum ; Fr. Acide (du Citron) citrique ; Ger. Citronensäure, Citronsäure.) An organic acid usually prepared from lemon juice or that of lime.

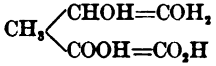
Manufacture: Citric acid occurs in juices of plants, especially in their fruit, as strawberry, raspberry, cherry, currant, lemon, lime, gooseberry, cranberry, tamarind, tomato, etc. Usually from lemon juice by first clarifying by ebullition, then neutralizing with chalk, boiling precipitated calcium citrate with dil. sulphuric acid. (1) $2H_3C_6H_5O_7 + 3CaCO_3 = Ca_3(C_6H_5O_7)_2 + 3CO_2 + 3H_2O$. (2) $Ca_3(C_6H_5O_7)_2 + 3H_2SO_4 = 2H_3C_6H_5O_7 + 3CaSO_4$. It is in colorless, translucent, right-rhombic prisms, odorless, agreeable acid taste, efflorescent in warm air, deliquescent in moist air, soluble in 0.63 part water, 1.61 alcohol, loses water of crystallization at 75–135° C. (167–275° F.). *Assay:* To neutralize 3.5 Gm. requires 50 Cc. potassa V. S. (each Cc. of V. S. corresponding to 2 p. c. of pure salt), phenolphtalein indicator. *Im-*

purities: Calcium, copper, lead, sulphuric, tartaric, and oxalic acids. Dose, gr. 5–30 (.3–2 Gm.).

PREPARATION.—1. *Syrupus Acidi Citrici.* Syrup of Citric Acid. (Syn., Fr. Sirop (d'Acide citrique) de Limon; Ger. Citronsäuresirup.) *Manufacture:* 1 p. c. Dissolve citric acid 1 Gm. in water 1 Cc., add syrup 50 Cc., then spirit of lemon 1 Cc., and syrup q. s. 100 Cc. Dose, ʒj–4 (4–15 Cc.).

PROPERTIES AND USES.—Irritant, antiscorbutic, stimulant, diuretic, refrigerant; rheumatism, hemorrhage, jaundice, scurvy, fevers, antidote to alkaline and narcotic poisons, good locally to diphtheritic angina, gangrenous sore mouth, jaundice, pruritus, cancerous tumors, reduces obesity, long usage emaciates.

Acidum Lacticum. Lactic Acid, $HC_3H_5O_3$.—(Syn., Isolactic, Ethyledene-lactic, or Oxypropionic Acid; Fr. Acide lactique; Ger. Milchsäure.) An organic acid, usually obtained by subjecting milk sugar or grape sugar to lactic fermentation, composed of 75 p. c. by weight of absolute lactic acid, $HC_3H_5O_3$, and 25 p. c. of water. This is the second member of a group of monobasic diatomic acids which contain two hydroxyl groups, the hydrogen in one (the upper COH_2) being replaceable by alcohol, that of the other (lower CO_2H) by metals.



Manufacture: Lactic acid occurs in gastric juice, urine, intestinal juices, many plant juices, sour milk, sour cabbage, and is produced from sugar by the special lactic ferment (*Bacte'rium la'ctis*). On the larger scale flour is treated with H_2SO_4; this converts starch into glucose, free acid is neutralized with milk of lime, and to this is added sour milk, which causes long fermentation, which, however, must be checked after several weeks' duration by heating to 100° C. (212° F.) in order to prevent butyric acid fermentation; the hot solution of calcium lactate is filtered and evaporated to crystallization; saturate this salt with sulphuric (oxalic) acid —$C_6H_{12}O_6 = 2HC_3H_5O_3$. It is a colorless, syrupy liquid, odorless, acid taste, hygroscopic, sp. gr. 1.213, miscible with water, alcohol, ether. *Assay:* To neutralize 4.5 Gm. requires 37.5 Cc. potassa V. S. (each Cc. of V. S. corresponding to 2 p. c. absolute acid), phenolphtalein indicator. *Impurities:* Iron, lead, chloride, sulphate, sarcolactic acid, sugars, glycerin, organic impurities. Dose, ʒss–2 (2–8 Cc.), in lemonade. If by enema, the acid should be neutralized by sodium bicarbonate.

FIG. 440.

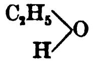
Citric acid crystal.

PREPARATION.—1. *Syrupus Calcii Lactophosphatis*, 6 p. c. Dose, ʒj–4 (4–15 Cc.).

PROPERTIES AND USES.—Caustic, large doses hypnotic, stomachic. Lactic acid has gained its popularity from the fact of its being one of the visceral constituents. Given in dyspepsia, phosphatic deposits, tuberculous diarrhœa, green infantile diarrhœa, diabetes, rheumatism, otitis, ulcers of nasal fossæ, diphtheria, croup, insomnia, caustic to fungous caries, lupus, epithelioma, ulcers, morbid growths in the larynx, tuberculous ulcers, laryngeal and pharyngeal affections.

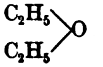
V. Ethers.

These are formed from alcohols by replacing hydrogen of hydroxyl by the same or other alcohol radicals, thus :



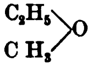
$\begin{matrix}C_2H_5\\H\end{matrix}\!>O$

Ethyl Alcohol



$\begin{matrix}C_2H_5\\C_2H_5\end{matrix}\!>O$

Ethyl Ether

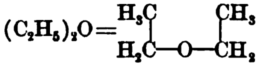


$\begin{matrix}C_2H_5\\C\,H_3\end{matrix}\!>O$

Ethyl-methyl Ether

Ethers are the oxides of organic radicals or residues, and these latter may be alike or different, thus giving simple or mixed ethers.

Æther. Ether.

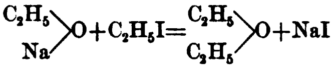


$(C_2H_5)_2O=\begin{matrix}H_3C & & CH_3\\ | & & |\\ H_2C & -O- & CH_2\end{matrix}$

(Syn., Æther Fortior, Æther Sulphuricus, Hydric Ether, Naphtha Vitrioli, Hydrate of Ethylen, Oxide of Ethyl; Fr. Ether hydrique—vinique—sulfurique; Ger. Æther, Schwefeläther.) A liquid composed of 96 p. c. by weight of absolute ether or ethyl oxide $(C_2H_5)_2O$, and 4 p. c. alcohol containing a little water.

Manufacture: 1. By action of chloride or iodide of hydrocarbon residue upon an alcohol in which the hydrogen of hydroxyl has been replaced by a metal.

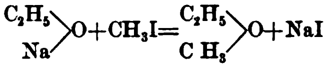
(1)



$\begin{matrix}C_2H_5\\Na\end{matrix}\!>O+C_2H_5I=\begin{matrix}C_2H_5\\C_2H_5\end{matrix}\!>O+NaI$

Sodium Ethylate Ethyl Iodide

(2)



$\begin{matrix}C_2H_5\\Na\end{matrix}\!>O+CH_3I=\begin{matrix}C_2H_5\\C\,H_3\end{matrix}\!>O+NaI$

Methyl Iodide Ethyl-methyl Ether

2. By action of sulphuric acid on alcohols, whereby water is removed, this is the general process, and consists in distilling together alcohol and sulphuric acid at about 130° C. (266° F.).

$$C_2H_5OH+H_2SO_4=C_2H_5HSO_4+H_2O$$

Ethyl Sulphovinic Acid

This sulphovinic acid acts upon another alcohol molecule, giving ether —$C_2H_5HSO_4+C_2H_5OH=(C_2H_5)_2O+H_2SO_4$. This process, in theory, is continuous, the H_2SO_4 last formed again acting on fresh alcohol as it is supplied; in practice this is not true, as the H_2SO_4 becomes, after a time, so weak from the remaining water, which never entirely goes over, that it will not act upon the alcohol. Each gallon (4 L.) of alcohol yields about 4 lbs. (2 Kg.) of ether. *Impurities:* Water, alcohol, aldehyde, metals, sulphurous and sulphuric acids. These are removed by shaking with calcium chloride and oxide and redistilling the supernatant liquid. It is a transparent, colorless, mobile liquid, characteristic odor, burning, sweet taste, sp. gr. 0.725–0.728, soluble in 10 vols. water, miscible with alcohol, chloroform, etc., very inflammable, boils at 37° C. (98.6° F.), very volatile. Should be kept cool, remote from lights, fire, in well-stoppered containers, preferably tin cans. Dose, ♏v–60 (.3–4 Cc.).

PREPARATIONS.—1. *Spiritus Ætheris.* Spirit of Ether. (Syn., Liquor Anodynus Mineralis Hoffmanni; Fr. Æther Sulfuricus Alcoolisatus, Éther hydrique (sulfurique) alcoolisé, Liqueur anodine d'Hoffmann; Ger. Spiritus Æthereus, Ätherweingeist, Hoffmann'(sche) Tropfen.)

Manufacture: Mix ether 32.5 Cc., alcohol 67.5 Cc. Dose, ♏xv–60 (1–4 Cc.).

2. *Oleum Æthereum.* Ethereal Oil. (Syn., Oleum Vini, Heavy Oil of Wine; Fr. Huile (volatile éthérée) d'Ether; Ger. Schweres Weinöl.) A volatile liquid consisting of equal volumes of heavy oil of wine and ether.

Manufacture: Alcohol 1,000 Cc., sulphuric acid 1,000 Cc., distilled water 25 Cc., ether q. s. By distillation of the first two; when the oily drops cease to pass over the yellow ethereal liquid is separated from the distillate, washed with the water, and mixed with equal volume of ether. It is a transparent, nearly colorless, volatile liquid, peculiar aromatic, ethereal odor, pungent, refreshing, bitter taste, sp. gr. 0.910.

3. *Spiritus Ætheris Compositus.* Compound Spirit of Ether. (Syn., Hoffmann's Anodyne; Fr. Liqueur Nervine de Bang; Ger. Zusammengesetzter Ätherweingeist.)

Manufacture: Mix ether 32.5 Cc., alcohol 65 Cc., ethereal oil 2.5 Cc. Dose, ♏v–60 (.3–4 Cc.).

PROPERTIES.—Internally, acts like chloroform or alcohol, cardiac stimulant, anæsthetic, narcotic, carminative, antispasmodic. Externally, irritant, local anæsthetic, stimulant, refrigerant. The heart, vaso-motor and respiratory centres are much more difficult to paralyze by ether than by chloroform; ether, however, is a greater renal and bronchial irritant, also occasions greater vomiting and a more protracted stage of stimulation, hence more struggling.

USES.—Internally, nausea, dyspepsia, flatulent and biliary colic, neuralgia of the gums, earache, fainting, cardiac failure or palpitation, asthma; here more rapid than chloroform in action, hence for these cases it is better. Ether is inhaled to blunt sensibility in surgical operations, to relax muscles in dislocations, strangulated hernia, neuralgia, biliary and renal colic, dysmenorrhœa, tetanus, spasms, asthma, chronic bronchitis, labor, extracting teeth, headache, vomiting of pregnancy, hysteria, tænia, biliary calculi, whooping-cough, spasmodic croup, delirium tremens, mania, lumbago, sciatica, collapse in opium and chloral hydrate poisoning, convulsions. Should inhale ether slowly through the nostrils, on empty stomach and guard the pulse closely. If beats become slow, feeble, or quick, the sponge must be at once removed; best inhaled from sponge fixed in a paper cone having the larger end over the face and the smaller end cut off to admit a small amount (30 p. c.) of air. It requires about ℥ij (60 Cc.) and 5–15 minutes to produce insensibility. In recovery have more nausea and vomiting than in chloroform, which may be checked by sodium bromide gr. 15 (1 Gm.); must not use it at night, near flame or fire. One death occurs from every 16,000 inhalations. Externally, headache, toothache, earache, neuralgia, deafness, photophobia, hernia, hiccough, malignant pustule, carbuncle, tonsillitis. Can also freeze part to be operated upon by ether, and thus deaden all pain. The two spirits are useful in sleeplessness, restlessness, nervous disturbance, hysteria, flatulent and uterine colic.

Incompatibles: Arterial sedatives, strychnine, picrotoxin.

Synergists: Arterial and cerebral stimulants, chloroform, alcohol, etc.

Æther Aceticus. Acetic Ether, $C_2H_5C_2H_3O_2{=}CH_3,CO,OC_2H_5$. —(Syn., Ethyl Acetate, Naphtha Aceti; Fr. Éther acétique, Acétate d'Éthyle, Naphte acétique; Ger. Essigäther, Essignaphtha.) A liquid composed of 98.5 p. c. by weight of ethyl acetate, $C_2H_5C_2H_3O_2$, and 1.5 p. c. of alcohol containing a little water.

Manufacture: Distil a mixture of dry sodium acetate, alcohol, and sulphuric acid — $C_2H_5OH + NaC_2H_3O_2 + H_2SO_4 = C_2H_5C_2H_3O_2 + NaHSO_4 + H_2O$. The distillate is purified from water and acid by digestion with K_2CO_3, or by shaking with $CaCl_2$ and redistilling. It is a transparent, colorless liquid, fragrant, refreshing, acetous odor, peculiar acetous, burning taste, sp. gr. 0.893–0.895, boils at 76° C. (168.8° F.), soluble in water 8 parts, miscible with alcohol, ether, fixed and volatile oils, volatile, inflammable. *Impurities:* Butylic and amylic derivatives, alcohol, water, carbonizable organic substance. Should be kept cool, dark, remote from lights, fires, in well-stoppered bottles. Dose, ♏xx–60 (.6–4 Cc.).

Properties and Uses.—Acts like ether, as stimulant, antispasmodic, carminative, but has a more pleasant taste; syncope, nervous agitation, colic, flatulence; may be inhaled for laryngeal and bronchial irritation, nervous cough. Externally, same as ether.

Spiritus Ætheris Nitrosi. Spirit of Nitrous Ether, $C_2H_5NO_2$.—(Syn., Spiritus Nitri Dulcis, Sweet Spirit of Nitre, Ethyl Nitrite, Spiritus Nitrico-Æthereus; Fr. Ether azoteux alcoolisé, Liqueur anodine nitreuse; Ger. Versüsster Salpetergeist.) An alcoholic solution of Ethyl Nitrite, $C_2H_5NO_2$, yielding when freshly prepared and tested in a nitrometer not less than eleven times its own volume of nitrogen dioxide, NO.

Manufacture: Add to sodium nitrite 770 Gm., dissolved in a litre of water, deodorized alcohol 550 Cc., in a flask connected with a condenser, kept cold by ice-cold water; gradually introduce into the containing flask sulphuric acid 520 Gm., previously diluted with a litre of water; now distil, catching distillate in an ice-cold receiver; wash distillate with ice-cold water to remove alcohol, then with Na_2CO_3 10 Gm. in solution to remove all traces of acid; separate ether from aqueous liquid, agitate former with K_2CO_3 30 Gm. in solution to remove all traces of water, and add twenty-one times its weight of deodorized alcohol. It is a clear, mobile, volatile, inflammable liquid, pale-yellow or greenish-yellow tint; fragrant, ethereal, pungent odor; free from acidity; sharp, burning taste, sp. gr. 0.836–0.842. *Assay:* 5 Cc. put into a nitrometer + 10 Cc. potassium iodide T. S. + 10 Cc. normal H_2SO_4, the volume of nitrogen dioxide, NO, generated should be 55 Cc., corresponding to 4 p. c. of pure ethyl nitrite. *Impurities:* Aldehyde, acetic acid. Dose, ʒss–2 (2–8 Cc.).

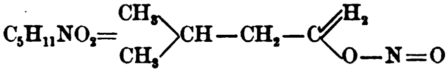
PROPERTIES.—Diffusible stimulant, stomachic, carminative, diaphoretic, diuretic, anæsthetic, antispasmodic, antipyretic.

USES.—Febrile condition to promote sweating, strangury, urinary and kidney affections, flatulence, nausea, nervous agitation, coughing, headache, chronic bronchitis, fevers, in ordinary cold, chronic Bright's, cardiac, and pulmonary diseases.

Incompatibles: Potassium iodide, ferric sulphate, mucilage of acacia, tincture of guaiac(um), antipyrine, emulsions, tannin, gallic acid.

Synergists: Diaphoretics, diuretics, antispasmodics, potassium citrate, tincture of aconite, etc.

Amyl Nitris. Amyl Nitrite.



$$C_5H_{11}NO_2 = \begin{matrix} CH_3 \\ CH_3 \end{matrix} \!\!> CH-CH_2-C \begin{matrix} {/\!\!/} H_2 \\ \diagdown O-N=O \end{matrix}$$

(Syn., Amyl Æther Nitrosus, Amylo-nitrous Ether; Fr. Azotite d'Amyl, Ether amylazoteux; Ger. Amylium Nitrosum, Amyl Nitrit.) A liquid containing 80 p. c. of amyl (principally iso-amyl) nitrite, $C_5H_{11}NO_2$, together with variable quantities of undetermined compounds.

Manufacture: 1. Distil equal volumes of pure amylic alcohol and nitric acid—$C_5H_{11}OH + HNO_3$ (deoxidizing into HNO_2) $= C_5H_{11}NO_2 + H_2O$. 2. Distil sodium nitrite, amyl alcohol, and sulphuric acid—$2C_5H_{11}OH + 2NaNO_2 + H_2SO_4 = 2C_5H_{11}NO_2 + Na_2SO_4 + 2H_2O$. Purify the distillate from traces of acid by shaking with potassium or sodium carbonate or hydrate in solution, separate upper layer and redistil; that portion of the liquid passing over between 95–100° C. (203–212° F.) is the amyl nitrite. It is a clear yellow or pale-yellow liquid, peculiar ethereal, fruity odor, pungent, aromatic taste, sp. gr. 0.870–0.880, insoluble in water, miscible with alcohol or ether, volatile. *Assay:* 0.26 Gm.+5 Cc. alcohol, put into a nitrometer+10 Cc. potassium iodide T. S. + 10 Cc. normal sulphuric acid V. S., the volume of nitric oxide, NO, generated should be 40 Cc. (each Cc. indicating 2 p. c. of pure amyl nitrite). *Impurities:* Free acid, aldehyde, amyl nitrate, water. Should be kept cool, dark, remote from lights or fire, in dark-amber, glass-stoppered vials. Dose, ♏j–3 (.06–.2 Cc.), cautiously inhaled from a handkerchief in which a glass tear (capsule) containing the amyl nitrite has been crushed. Internally give ♏ss–1 (.03–.06 Cc.), dissolved in alcohol.

Properties.—Irritant, sedative, depressant, antispasmodic, anodyne, diuretic. Causes flushed face, rapid and violent heart beats, throbbing head, headache, giddiness, dilated pupils, increased respiration.

Uses.—Relax spasms, angina pectoris, organic heart-trouble, asthma, convulsions after labor, spasmodic dysmenorrhœa, tetanus, hysterical convulsions, epileptical paroxysms, neuralgia, headache, whooping-cough, hiccough, pregnant vomit, syncope, faintness, hepatic and renal colic, spasm of the glottis, vertigo, pneumonia, intermittent fever, night-sweats, chorea, infantile convulsions, hydrophobia, chordee, exophthalmic goitre, chloroform syncope, seasickness, strychnine, chloral hydrate, cocaine, and carbonic-acid poisoning, insomnia from opium-habit. Externally, as an anodyne in headache, toothache, earache, neuralgia, dysmenorrhœa; fetor of gangrene, secretions, and exudations, modified by its solution. Should not be used where there is profuse hemorrhage, or when there is organic heart or brain disease.

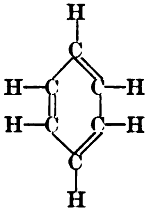
AROMATIC SERIES.

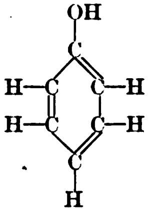
As previously stated, all organic compounds are either derivatives of methane, CH_4 (fatty series), or of benzene, C_6H_6 (aromatic series), and while these two parental compounds are strictly hydrocarbons, they as well as their derivatives are thoroughly distinctive, as they cannot in any sense be substituted for or converted into one another. The fatty series, in a degree, furnish products that might be used as animal food; the aromatic series have not this power, being simply aromatics, antiseptics, stimulants. Many compounds of this latter series are produced in the vegetable kingdom and a great number are obtained by destructive distillation. When coal-tar is distilled and the distillate carried over and caught in water, it separates into two layers—*light oil* floating on top of the water, *heavy oil* sinking below it; from the former comes benzene, etc., from the latter carbolic acid, etc.

Acidum Carbolicum Crudum. Crude Carbolic Acid, C_6H_5-OH+.—(L. *carb*(on), coal, + *ol*(eum), oil, + *ic*.) (Syn., Fr. Acide phénique cru; Ger. Rohe Carbolsäure.)

Manufacture: A liquid consisting of various constituents of coal-tar, chiefly cresol and phenol, obtained by fractional distillation of the heavy oil (*dead oil*) between 150–200° C. (302–392° F.), and twice rectifying this product between 160–190° C. (320–374° F.). It is a nearly colorless, or reddish-brown liquid, strongly empyreumatic, creosote-like odor, having a benumbing, blanching, caustic effect upon the skin and mucous membrane, darkens by age. *Impurities:* Alkalies and less soluble constituents of coal-tar.

Acidum Carbolicum. Carbolic Acid, C_6H_5OH.—(Syn., Phenol, Acidum Phenicum—Phenylicum (Crystallizatum), Phenic—Phenylic Acid, Phenylic Alcohol; Fr. Acide carbolique—phénique, Hydrate de Phényle; Ger. Karbolsäure, Phenylsäure, Phenylalkohol.) A constituent of coal-tar obtained by fractional distillation and subsequently purified. It is the alcohol of the hydrocarbon benzene, and according to the number of hydrogen atoms replaced by the hydroxyl, OH, do we have mon-, di-, tri-atomic, etc., phenols or alcohols. This hydroxyl here is acid, whereas that in methane alcohols is basic; these phenols or phenol alcohols differ from common alcohols in not yielding aldehydes or acids by oxidation and having hydroxyl (OH) that is acid.


Benzene


Carbolic Acid

Manufacture: From crude carbolic acid by agitating with warm concentrated NaOH solution, when crystalline sodium carbolate (phenolate), C_6H_5ONa, is formed and the neutral oils are left unacted upon; these latter are poured off and the crystals freed from foreign matter by heating to 170° C. (338° F.) and treating with 10 parts water. This solution is decomposed with HCl, thus setting free carbolic acid in an oily layer upon the surface. This is now repeatedly shaken with solution of common salt and digested with calcium chloride to remove water; then the resulting carbolic acid distilled between 165–185° C. (330–365° F.) and crystallized. It is in colorless, or reddish needle-shaped crystals or mass, aromatic odor, when greatly diluted with water sweetish taste, afterward burning, deliquescent, soluble in 15 parts water, freely in alcohol, chloroform, ether, fixed and volatile oils, boils at 188° C. (370.4° F.; pure phenol at 178° C.; 352° F.). *Assay:* To convert 0.039 Gm. into tribromophenol should require 24 Cc. $\frac{N}{10}$ bromine V. S. (each Cc. of V. S. corresponding to 4 p. c. absolute phenol). *Tests:* 1. With ferric chloride T. S. get violet-blue color in weak solutions. 2. Coagulates albumin, collodion, and thus chars the skin. *Impurities:* Creosote, cresylic acid. Dose, gr. ½–1 (.03–.06 Gm.).

PREPARATIONS.—1. *Glyceritum Acidi Carbolici.* Glycerite of Carbolic Acid. (Syn., Fr. Glycérole (Glycéré) d'Acide phénique, Glycérine phénique; Ger. Phenol(Phenyl)-Glycerit.)

Manufacture: 20 p. c. Stir together until dissolved carbolic acid 20 Gm. and glycerin 80 Gm. Dose, ♏ij–5 (.13–.3 Cc.).

2. *Unguentum Acidi Carbolici.* Ointment of Carbolic Acid. (Syn., Fr. Pommade (d'Acide) phénique; Ger. Phenolsalbe.)

Manufacture: 5 p. c. Mix carbolic acid 5 Gm. with ointment 95 Gm.

PROPERTIES.—Internally, sedative, anti-fermentative, antipyretic, irritant, poisonous. Externally, antizymotic, antiseptic, disinfectant, deodorant, anæsthetic, irritant caustic. Rapidly destroys animal and vegetable organized ferments, also those of septic diseases, and prevents formation of their decomposition products. In the stomach is converted into a sulpho-carbolate, but may circulate as an alkaline carbolate. Diminishes the production of heat and increases its dissipation, renders urine dark.

USES.—Internally, vomiting, diarrhœa, flatulent dyspepsia, typhoid and intermittent fevers, scarlatina. Externally, in spray, ulcers, gangrene, phthisis, chronic bronchitis, whooping-cough, diphtheria, erysipelas, pain of burns, polypi, venereal abscesses, boils, carbuncles, hemorrhoids, varicose veins, goitre, hydrocele, sore nipples, granular ophthalmia, otorrhœa, earache, surgical operations, freckles, acne, prurigo, ring-worm, warts, bee-stings, sore throat, toothache, rheumatism, bunions, diabetes.

Poisoning: Have burning sensation, collapse, cold, clammy skin, weak pulse, feeble, shallow breathing, urine dark-green, white eschars from the mouth, vomiting, purging, insensibility, comatose, death. Give quick emetic—apomorphine hypodermically—or wash out stomach, follow with magnesium or sodium sulphate (℥j; 30 Gm. + water ℥viij; 240 Cc.), then stimulants, ether, brandy, atropine and strychnine hypodermically, digitalis, coffee, demulcent drinks (no oils or glycerin), opium, apply hot water bottle, bag, or blankets, etc.

Incompatibles: Bromine, metallic salts, antipyrine, collodion, alkalies, lime, soluble sulphates, atropine.

Synergists: Antiseptics, motor depressants.

Creosotum. Creosote, $C_7H_8O_2 + C_8H_{10}O_2$.—(Gr. *χρέας*, flesh, + *σώζειν*, to preserve; *i. e.*, its preserving properties.) (Syn., Fr. Créosote; Ger. Kreosotum, Kreosot.) A mixture of phenols, chiefly guaiacol, $C_7H_8O_2$, and creosol, $C_8H_{10}O_2$, obtained during the distillation of wood-tar, preferably of that derived from the beech (*Fagus sylvatica*, Fagaceæ), which yields about 5 p. c.

Manufacture: The wood-tar is distilled until one-half is passed over, the distillate separates into a *light* and *heavy* oily layer, with an intervening aqueous acid stratum; to the heavy oily layer add strong Na_2CO_3 solution (to remove acid constituents) and then distil the separated oily liquid, that portion of the distillate being collected which is heavier than water; this distillate is treated with KOH solution, sp. gr. 1.12, whereby the creosote is dissolved, now add H_2SO_4, and the precipitated creosote is well washed and distilled at 200–220° C. (392–428° F.). It is a colorless, yellowish or pinkish, refractive, oily liquid, penetrating, smoky odor, burning, caustic taste, darkens by age and light, sp. gr. 1.070, soluble in 150 parts of water, freely in alcohol, ether, chloroform, acetic acid, fixed and volatile oils. *Impurities:* Carbolic acid, neutral oils, cœrulignol and other high boiling constituents of wood-tar. Dose, ♏ss–2 (.03–.13 Cc.).

PREPARATION.—1. *Aqua Creosoti.* Creosote Water. (Syn., Fr. Eau créosotée; Ger. Kreosotwasser.)

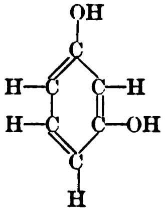
Manufacture: Agitate vigorously creosote 1 Cc., with distilled water 99 Cc., filter. Dose, ʒj–4 (4–15 Cc.).

PROPERTIES AND USES.—Externally, stimulant, antiseptic, parasiticide, anæsthetic; nausea, vomiting, diarrhœa, pregnant and hysteria vomit, cholera morbus, cholera infantum, typhoid fever, dysentery, tapeworm, diabetes, polyuria, phthisis, burns, chilblains, erysipelas, menorrhagia, uterine hemorrhage, leucorrhœa, puerperal metritis, fetid otorrhœa, diphtheritic sore throat, chronic empyema, toothache, gleet, ulcers, cancer, gangrene, mercurial stomatitis, glanders, ozæna, itching, lupus, warts, condylomata, as a preservative to animal tissue. The water (aqua) used in leucorrhœa, gleet, burns, ulcers, eczema, prurigo, etc. Creosote differs from carbolic acid: 1. Creosote with Fe_2Cl_6 gives violet color, changing to green-brown and to brown precipitate—with carbolic acid get permanent purple color. 2. Creosote is insoluble in glycerin; carbolic acid is soluble. 3. Creosote does not precipitate collodion or coagulate albumin, but carbolic acid does. 4. Creosote is liquid, boils at 205° C. (401° F.); carbolic acid solidifies upon cooling, boils at 188° C. (370.4° F.). 5. Creosote is less poisonous than carbolic acid.

Poisoning: Same as for carbolic acid.

Incompatibles: Strong sulphuric and nitric acids, reduces silver salts, exploding with the oxide.

Resorcinum. Resorcin, $C_6H_4(OH)_2$.—(Fr. *res*(in)+*orc*(hella)+*in*; *i. e.*, resinous, and peculiarly colored substance.) (Syn., Resorcinol,

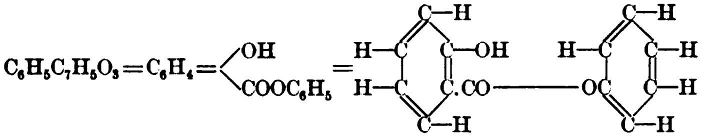


Metadioxybenzol; Fr. Résorcine; Ger. Resorcin.) A diatomic phenol which should be kept in dark, amber-colored vials.

Manufacture: While it can be made by fusing different resins, as galbanum, guaiac(um), ammoniacum, asafetida, etc., with caustic alkalies, it is mostly done by heating benzene with four times its weight of H_2SO_4, forming benzene metadisulphonic acid, $C_6H_4(HSO_3)_2$, which is dissolved in water and neutralized with milk of lime, the $CaSO_4$ is expressed, and Na_2CO_3 added, filtrate evaporated to dryness, which heated with NaOH forms sodium resorcin, $C_6H_4(ONa)_2$, boil to drive off SO_2 and extract residue with ether, which being distilled leaves impure resorcin; can purify by sublimation or recrystallization from water or benzene. It is in colorless or reddish needle crystals, peculiar odor, sweetish, pungent taste, reddish-brown by age, volatile, soluble in water, alcohol, ether, glycerin. *Impurities:* Empyreumatic bodies, phenol-odor. Dose, gr. 2–5 (.13–.3 Gm.).

PROPERTIES AND USES.—Allied to carbolic acid; antipyretic, depressant; gastric ulcer, fermentative dyspepsia (an hour after food), vomiting, cholera infantum, diarrhœa, rheumatism, typhoid fever, pneumonia, scarlatina, pleurisy, phthisis, cystitis, vomiting, seasickness. Solution in chronic otitis, gonorrhœa, leucorrhœa, whooping-cough, chronic aphonia, larynx ulcers, gangrene, morbid growths, boils, carbuncles, frost-bites, ulcers, fissures, erysipelas, erythema, eczema, psoriasis, herpes, alopecia, chancres, papilloma, myomas, diphtheria. *Poisoning:* Same as for carbolic acid.

Salol. Salol.—(Fr. *sal*(icylic) + (phen)*ol; i. e.*, referring to its components.) (Syn., Phenyl Salicylate; Fr. Salicylate de Phenol; Ger. Salolum, Salicylsäure-phenyl-æther.)



$$C_6H_5C_7H_5O_3 = C_6H_4 = \left\langle \begin{matrix} OH \\ COOC_6H_5 \end{matrix} \right. =$$

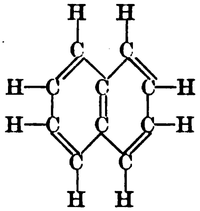
Manufacture: 1. Treat sodium phenol(ate)+sodium salicylate with a dehydrating agent as phosphorus oxychloride, or a slow current of phosgene (carbonyl chloride)—$2C_6H_5ONa + 2C_6H_4(OH)CO_2Na + POCl_3 = 2C_6H_4(OH)CO_2C_6H_5 + 3NaCl + PO_3Na$; dissolve resulting salol in alcohol, crystallize. 2. Heat salicylic acid in an atmosphere of carbon dioxide—(1) $2HC_7H_5O_3 +$ heat $= 2(C_6H_4CO_2H)O + H_2O$, (2) $2(C_6H_4CO_2H)O = C_6H_5C_7H_5O_3 + CO_2$. It is first changed into its anhydride and then into phenyl salicylate; dissolve in alcohol, crystallize. Salol occurs as a white crystalline powder, faintly aromatic odor, nearly tasteless, permanent, neutral, no residue, soluble in chloroform, fixed and volatile oils, 10 parts alcohol, 0.3 ether, nearly insoluble in water; melts at 42° C. (108° F.). *Tests:* 1. Heated with NaOH decomposes into phenol (recognized by its odor) and sodium salicylate, from which we get salicylic acid crystals upon supersaturating liquid with HCl; bromine water gives white precipitate in alcoholic solutions. 2. To 10 Cc. alcoholic solution (1+50) add few drops diluted ferric chloride T. S. (1+20), get violet tint; if order reversed, get white cloudiness, but no color upon shaking. 3. Shake 1 Gm. with 50 Cc. water, filtrate should not be affected by diluted ferric chloride T. S. (abs. uncombined carbolic or salicylic acid); nor by barium chloride T. S. (abs. sulphate, phosphate); nor by silver nitrate T. S. (abs. chloride). Dose, gr. 5–30 (.3–2 Gm.), in pill, capsule, emulsion, or milk.

PROPERTIES.—Antiseptic, antipyretic, anti-rheumatic.

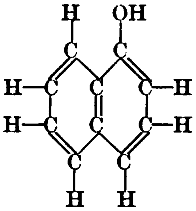
USES.—Rheumatism, neuralgia, lancinating pains, diarrhœa, dysentery, cholera, ulcers, ozæna, diphtheria, gonorrhœa, otorrhœa, vesical catarrh, fermentative dyspepsia, typhoid fever, cystitis, substitute for iodoform in surgery. Salol in the small intestine splits into phenol 36 p. c. and salicylic acid 64 p. c., consequently it is more dangerous than salicylic acid from the presence of phenol, which latter colors the urine dark. Death has been occasioned by gr. 15 (1 Gm.), and by gr. 120 (8 Gm.), giving in each case signs of carbolic acid poisoning.

NAPHTHALENE DERIVATIVES.

Naphthalinum. Naphtalin. (Naphtalene.) $C_{10}H_8$.—(L. *naphth*(a) + *al*(cohol) + *in*, referring to its components.) (Syn., Tar Camphor, Camphor Balls; Fr. Naphthaline, Naphthalène; Ger. Naphthalin.) A hydrocarbon obtained from coal-tar.



Naphtalin, $C_{10}H_8$



Naphtol, $C_{10}H_7OH$

Manufacture: Formed by the union of two benzene groups, so as to have two carbon atoms in common, by distilling coal-tar between 180–250° C. (356–482° F.). The distillate of heavy oil contains the naphtalin, which is treated successively with NaOH and H_2SO_4 (to remove acid and basic by-products), then purified by distillation in the presence of steam, further heating with H_2SO_4 and distilling. It is in colorless, shining, transparent laminæ, strong characteristic odor of coal-tar, burning, aromatic taste, slowly volatilized by exposure, insoluble in water, soluble in 15 parts alcohol, freely in ether, chloroform, CS_2, fixed and volatile oils. *Impurities:* Contaminations from coal-tar. Should be kept in well-stoppered bottles. Dose, gr. 2–15 (.13–1 Gm.).

PROPERTIES AND USES.—Antiseptic, expectorant, parasiticide, vermifuge; intestinal catarrh, inflammation, typhoid fever, diarrhœa, whooping-cough, chronic bronchitis, bronchorrhœa, wounds, ulcers, scabies, dysentery, prurigo. Dissolved in alcohol and used like spirit of camphor for sprains, contusions.

Naphtol. Naphtol. (Beta Naphtol.) $C_{10}H_7OH$.—(Gr. νάφθα; L. *napht*(ha) + *ol*(eum); *i. e.*, referring to its origin.) (Syn., Ger. Naphtholum, Iso-Naphtol.)

Manufacture: This phenol occurs in coal-tar, but is usually prepared artificially from naphtalin by the action of H_2SO_4, which forms beta-naphtalin-sulphonic acid, $C_{10}H_7HSO_3$; this acid is dissolved in water, saturated with milk of lime, and the resulting calcium salt separated by crystallization, redissolve crystals in water, decompose by Na_2CO_3, getting sodium naphtalin sulphonate, $C_{10}H_7SO_3Na$, which added to fused NaOH yields sodium naphtol, $C_{10}H_7ONa$, and sodium sulphite, $NaSO_3$. The former treated with HCl gives naphtol, which can be purified by sublimation and recrystallization. It bears the same relation to naphtalin as phenol does to benzene, is in colorless or pale-buff-colored shining crystalline laminæ or yellowish-white crystalline powder, faint phenol-like odor, sharp, pungent, non-persistent taste, permanent, soluble in 1,000 parts water, 0.75 alcohol, freely in ether, chloroform, caustic alkali solutions. *Impurities:* Naphtalin, alpha-naphtol (poisonous), organic impurities. Should be kept in dark-amber, well-stoppered bottles.

PROPERTIES AND USES.—Antiseptic, anti-fermentative, deodorizer, stimulant, typhoid fever, ozæna, eczema, prurigo, herpes, favus, conjunctivitis, chronic laryngitis, otitis, ringworm, psoriasis, scabies, abscesses, acne, diarrhœa, dysentery. Apply in alcoholic solution (5–15 Gm. to 1,000 Cc.) or ointment.

BENZENE-DERIVATIVES CONTAINING NITROGEN.

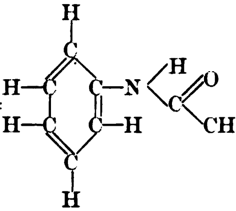
By analysis the exact molecular composition of many vegetable alkaloids has been determined, and inasmuch as many of these are troublesome to extract, hence expensive to the consumer, scientific experimenters have interested themselves in trying to reproduce artificially such substances, by joining these elements synthetically in their proper proportions. While this has often been impracticable, yet the building, substitution and replacement of elements toward such an end have been remarkable. The most satisfactory results have been where basal products are started with, which contain the necessary elements, though in a condition or form susceptible of easy change. The cheapest and most acceptable base so far observed is this coal-tar, of which mention has already been made in several connections. In experimenting with this myriads of approximate principles or alkaloids have been formed, many of which, although not having the exact formulæ, are almost identical in most respects with its true vegetable prototype. Beginning with coal-tar—it in the first place is distilled to obtain benzene, which is converted by nitric acid, into nitro-benzene and into this nascent hydrogen is passed, producing aniline or phenylamine, $C_6H_5NH_2$.

$$(1)\ C_6H_6 + HNO_3 = C_6H_5NO_2 + H_2O. \quad (2)\ C_6H_5NO_2 + 6H = C_6H_5NH_2 + 2H_2O.$$

Aniline (Ar. *anil*, indigo; *i. e.*, its brilliant, violet and indigo dyes) is therefore the assumed basal product, which is a colorless, oily, alkaline liquid, peculiar aromatic odor, bitter taste, boiling at 181° C. (359°F.), insoluble in water, poisonous; it is an amine acting like a base, hence combines with acids forming well-defined salts. We have only one official product of this source belonging here, but a number are mentioned in Part V. which are unofficial yet very useful in medicine.

Acetanilidum. Acetanilid. Phenylacetamide.—(Fr. *acet*(ic)+ *anil*(ine) + *id; i. e.*, referring to its components.)

$C_6H_5NH,C_2H_3O=$



(Syn., Antifebrin, Acetyl'amidobenzene.) An acetyl derivative of aniline.

Manufacture: The hydrogen in aniline is replaced by the acetic acid radical—acetyl, C_2H_3O—by boiling together aniline and glacial acetic acid for 1–2 days; now distil, collect portion passing over at 295° C. (563° F.), and when cool acetanilid congeals—$C_6H_5NH_2+HC_2H_3O_2 = C_6H_5NHC_2H_3O + H_2O$; can purify by repeated crystallization from water. It is in white, shining, micaceous, crystalline laminæ or powder, odorless, faintly burning taste, permanent, soluble in 194 parts water, 18 boiling water, 5 alcohol, 18 ether, freely in chloroform. *Test:* Aqueous solution with ferric chloride T. S. should not change the color of latter (abs. of aniline salts and allied substances). *Impurities:* Aniline salts and various allied substances. Dose, antipyretic, gr. 5 (.3 Gm.), anodyne gr. 1–2 (.06–.13 Gm.), in pill, tablet, capsule, or in alcohol, then diluted in water; can repeat every four hours.

PROPERTIES.—Antipyretic, analgesic, antispasmodic, diuretic (increases excretion of urea and uric acid), diaphoretic. Small doses cause quietness; if large, have headache, weakness, ringing in ears, a peculiar cyanosis, somnolence, mydriasis, temperature falls, slow respiration, feeble, irregular pulse, vomiting, profuse sweat, coma, collapse, general paralysis, dark urine; blue color due to formation of methæmoglobin in the blood. It breaks up in the system into acetic acid and aniline, while this latter oxidizes into paramidophenol. Action is chiefly on heart, liver and kidneys, causing fatty degeneration. Continued use is highly injurious.

USES.—Phthisis, typhoid fever, hyperpyrexia, locomotor ataxia, rheumatism, sciatica, lumbago, neuralgia, gangrene, cancer, headache, insomnia, epilepsy, whooping-cough. There are many proprietary preparations containing 50–90 p. c. of acetanilid with sodium bicarbonate, ammonium bromide, salicylic acid, etc.

Poisoning: Empty stomach, place in recumbent position, loosen clothing, plenty fresh air (for cyanosis), give diffusible stimulants (brandy, whiskey, alcohol, ammonia, ether injections), coffee, atropine, strychnine (hypodermic), heat to feet and body, oxygen inhalations, rub skin, castor oil.

Incompatibles: Caustic soda and potash, chloroform.

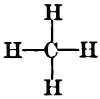
PART V.

NON-PHARMACOPŒIAL ORGANIC CARBON COMPOUNDS.

(Synthetic Remedies.)

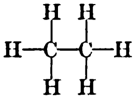
It must be borne in mind that the possibilities which the constructive processes of chemistry open to us are almost beyond limit. Many of those products which we have solely heretofore, and do mostly even now depend upon the crude vegetable drug for their origin, are at the present time being built up synthetically to such perfection as to often challenge any recognition of their distinctive sources. Of these there are a great number of considerable importance, and some would have been included in our last *Pharmacopœia* (1890), but for their partial secrecy in working formula and manufacture. Quite a number are so universally prescribed that the present day text-book would be considered decidedly incomplete unless some treatment of them was included. We have followed as near as would be practical the same ordered sequence as adopted heretofore with the official organic carbon compounds. Before taking them up individually it may be well to show, by graphic formulas, the facility with which the construction and substitution of one atom or a group of atoms for others can be effected—a process which invariably results in giving us each time a different substance. In order to do this, and to carry along direct relationship, some of the compounds which are official will have to be introduced at the sacrifice of repetition, but this may not be considered in the least a disadvantage to the student.

The majority of these synthetics which contain sulphur are hypnotics or sleep-producers, while those having nitrogen are antipyretics or anodynes.



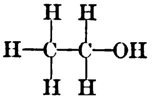
$H-\overset{H}{\underset{H}{C}}-H$

Methane=CH_4



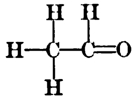
$H-\overset{H}{\underset{H}{C}}-\overset{H}{\underset{H}{C}}-H$

Ethane=C_2H_6



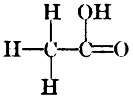
$H-\overset{H}{\underset{H}{C}}-\overset{H}{\underset{H}{C}}-OH$

Ethyl Alcohol=C_2H_5OH



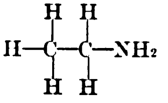
$H-\overset{H}{\underset{H}{C}}-\overset{H}{C}=O$

Aldehyde=C_2H_4O



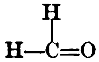
$H-\overset{H}{\underset{H}{C}}-\overset{OH}{C}=O$

Acetic Acid=$C_2H_4O_2$



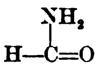
$H-\overset{H}{\underset{H}{C}}-\overset{H}{\underset{H}{C}}-NH_2$

Ethylamine=$C_2H_5NH_2$



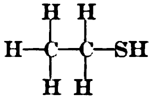
$$H-\overset{H}{C}=O$$

Formaldehyde=CH_2O



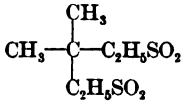
$$H-\overset{NH_2}{C}=O$$

Formamide=$CHO.NH_2$



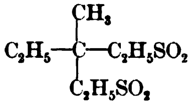
$$H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-SH$$

Mercaptan=C_2H_5SH



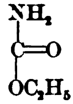
$$CH_3-\underset{C_2H_5SO_2}{\overset{CH_3}{C}}-C_2H_5SO_2$$

Sulphonal=$C_7H_{16}S_2O_4$



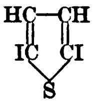
$$C_2H_5-\underset{C_2H_5SO_2}{\overset{CH_3}{C}}-C_2H_5SO_2$$

Trional=$C_8H_{18}O_4S_2$

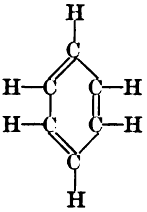


$$\underset{OC_2H_5}{\overset{NH_2}{C}}=O$$

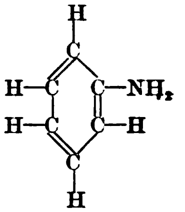
Urethane=$C_3H_7NO_2$



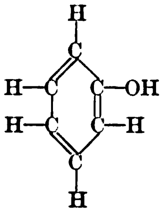
Thiophene-Di-iodide=$C_4H_2I_2S$



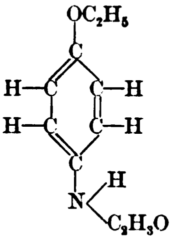
Benzene (benzol)=C_6H_6



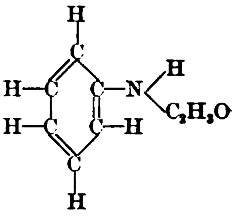
Aniline=$C_6H_5NH_2$



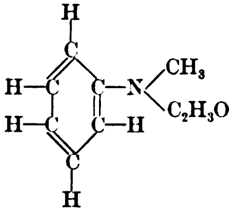
Phenol (Carbolic Acid)=
C_6H_5OH



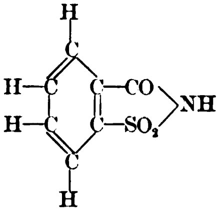
Phenacetin=$C_{10}H_{13}NO_2$



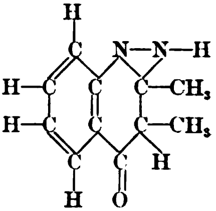
Acetanilid=C_8H_9NO



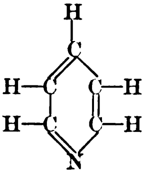
Exalgin=$C_9H_{11}NO$



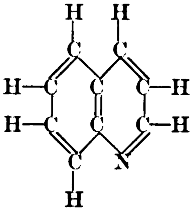
Saccharin=$C_7H_5NO_3S$



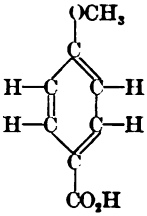
Antipyrine=$C_{11}H_{12}N_2O$



Pyridine=C_5H_5N

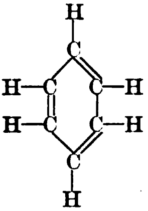


Chinoline=C_9H_7N

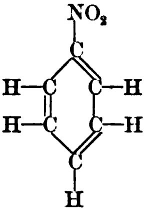


Anisic Acid=$C_8H_8O_3$

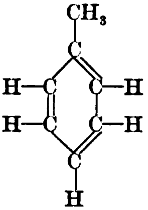
Hydrocarbons.



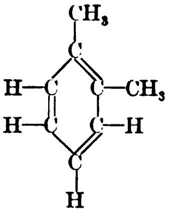
Benzene—C_6H_6



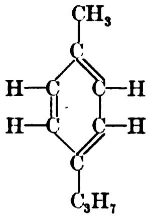
Nitro-benzene—$C_6H_5NO_2$



Toluene, Methyl-benzene—$C_6H_5.CH_3$

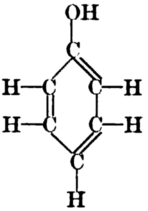


Xylene, Dimethyl-benzene —$C_6H_4(CH_3)_2$

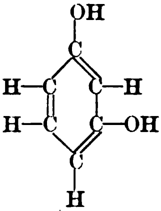


Cymene, Methyl-propyl-benzene—$C_6H_4.CH_3.C_3H_7$

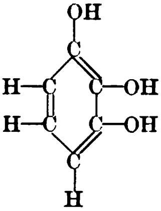
Alcohols.



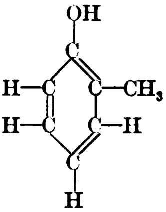
Phenol or Carbolic Acid—C_6H_5OH



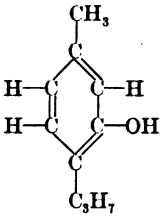
Resorcin=$C_6H_4(OH)_2$



Pyrogallol—$C_6H_3(OH)_3$

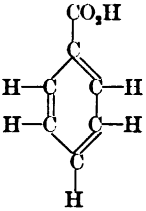


Cresol=$C_6H_4.CH_3.OH$

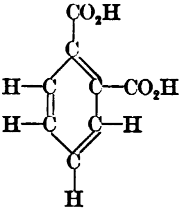


Thymol—$C_6H_3CH_3.C_3H_7OH$

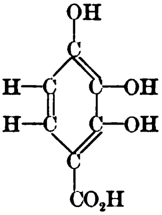
Acids.



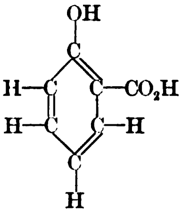
Benzoic Acid—$C_6H_5.CO_2H$



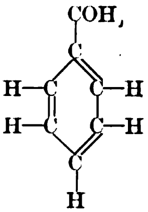
Phtalic Acid—$C_6H_4(CO_2H)_2$



Gallic Acid—$C_6H_2CO_2H.(OH)_3$



Salicylic Acid=$C_6H_4.CO_2H.OH$



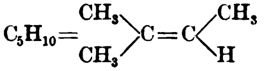
Benzaldehyde, Oil of Bitter Almond—$C_6H_5.COH$

FATTY SERIES (PARAFFIN OR METHANE.)

(OPEN-CHAIN COMPOUNDS.)

I. Hydrocarbons.

Pental. Pentalum.—Tri-methyl-ethylene, Iso-Amylene.



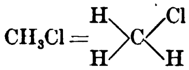
$$C_5H_{10}=\begin{matrix}CH_3\\CH_3\end{matrix}\!>C=C<\!\begin{matrix}CH_3\\H\end{matrix}$$

Manufacture: This is from the fifth member of the series, amylene. The amyl hydride (hydrate) or amylic alcohol is digested with zinc chloride for twenty-four hours, or preferably the two are shaken occasionally together for some time with diluted sulphuric acid; thus is produced amyl sulphuric acid, which when diluted with water yields tertiary amyl alcohol and pure pental which latter can be separated by fractional distillation. It is a colorless liquid, very inflammable and volatile, not affected by light or air, insoluble in water, miscible in all proportions with alcohol, chloroform and ether, sp. gr. 0.620, boils at 38° C. (100.4° F.).

PROPERTIES AND USES.—Anæsthetic; when inhaled acts as rapidly and safely as nitrous oxide gas, and superior to it in having a longer action and no unpleasant after-effect; acts more promptly than chloroform (1–3 minutes). Consciousness is not lost when the stage of pain-insensibility is reached; stage of exhilaration is seldom present, and does not lose effect by repetition. It is used for slight surgical operations, tooth-extraction, etc., being administered like chloroform. Dose, ♏v–10 (.3–.6 Cc.) internally, but for inhalation ʒij–4 (8–15 Cc.).

1. HALOGEN DERIVATIVES.

Methyl Chloride. Mono-chlor-methane.

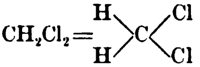


$$CH_3Cl=\begin{matrix}H\\H\end{matrix}\!>C<\!\begin{matrix}Cl\\H\end{matrix}$$

Manufacture: Methyl alcohol, hydrochloric acid (gas), and zinc chloride are heated together under pressure in a steam digester—$CH_3OH+HCl=CH_3Cl+H_2O$; the zinc chloride simply facilitates the process, the methyl chloride has now to be purified by washing with water, acid and alkali. It is a colorless gas, burning with a green flame, having an ether and chloroform-like odor, 1 vol. water dissolves 4 vols., while 1 vol. methyl or ethyl alcohol dissolves 35 vols.; it is also freely soluble in ether and chloroform. When cooled to −23° C. (−11.4° F.), under normal pressure, becomes a liquid which boils at −21° C. (−5.8° F.); a pressure of five atmospheres at normal temperature also condenses it.

PROPERTIES AND USES.—Local anæsthetic. It is usually kept in pointed glass pearls; the point being broken off, the heat of the hand is sufficient to volatilize the contents and thus force it out as a fine spray upon the desired part of application. Before applying it is well to wash the skin with soap and water to remove all fat, and hold spray-nozzle ten inches from the spot to be frozen. The skin soon becomes white and parchment-like, and then minor surgical operations, as opening abscesses, boils, etc., can be painlessly performed. The spray should not be continued longer than 2–4 minutes, as death of tissue may result.

Methylene Bichloride. Di-chlor-methane.

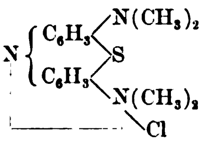


$$CH_2Cl_2 = \begin{matrix} H \\ H \end{matrix} > C < \begin{matrix} Cl \\ Cl \end{matrix}$$

Manufacture: Pass chlorine into methyl chloride (CH_3Cl), or reduce chloroform ($CHCl_3$) with zinc and hydrochloric acid. It is a colorless liquid, chloroform-like odor, insoluble in water, soluble in alcohol or ether, sp. gr. 1.354, boils at 40° C. (104° F.). It should be kept in well-stoppered bottles, in the dark, to prevent its decomposition; this can also be obviated by the addition of 1 p. c. alcohol. Dose, ♏x–30 (.6–2 Cc.), but mostly inhaled.

Properties and Uses.—Anæsthetic; for minor operations use ʒj–2 (4–8 Cc.), for major ones should not employ more than ʒiij–6 (12–24 Cc.).

Methylene Blue. Tetra-methyl-thionin Chloride, $C_{16}H_{18}N_3SCl$.

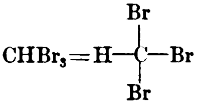


Manufacture: By treating acid solution of dimethylparaphenylenediamine, $NH_2C_6H_4N(CH_3)_2$, with hydrogen sulphide and ferric chloride. Occurs in small blue scaly crystals, with a copper-bronze tinge, tasteless, soluble in water, alcohol. Dose, gr. 1–5 (.06–.3 Gm.).

Properties and Uses.—Must not be confounded with methyl blue; anodyne, antiperiodic, antipyretic, analgesic, antiseptic; rheumatism, neuralgia, cystitis, intermittent fevers (good substitute for quinine), urethritis, colors urine blue, and may irritate neck of bladder.

Methyl Tri-chloride. Chloroformum. Chloroform.—Tri-chlor-methane, $CHCl_3$. (*Official.*) See page 747.

Methyl Tri-bromide. Bromoform.—Tri-brom-methane.



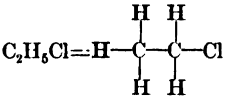
$$CHBr_3 = H - \overset{\displaystyle Br}{\underset{\displaystyle Br}{\overset{|}{\underset{|}{C}}}} - Br$$

Manufacture: Sodium hypobromite is first formed by adding bromine to a solution of sodium hydroxide; now this resulting salt is allowed to act on acetone; or saturate milk of lime with bromine, add alcohol and distil. It is a colorless, clear liquid, peculiar odor, sweetish taste, soluble in alcohol, slightly so in water; boils at 151° C. (304° F.), solidifies at 2.5° C. (37° F.), sp. gr. 2.83. Must be kept air-tight, in the dark, and when used should be free from acidity and color. Dose, ♏ij–5 (.13–.3 Cc.), on sugar, or in capsules, or in alcohol, glycerin, or compound tincture of cardamom.

Properties and Uses.—Anæsthetic by inhalation, but mostly given internally in whooping-cough and diphtheria. Must be used very cautiously, as it depresses the heart.

Methyl Tri-iodide. Iodoformum. Iodoform.—Tri-iodo-methane, CHI_3. (*Official.*) See page 750.

Ethyl Chloride. Mono-chlor-ethane.

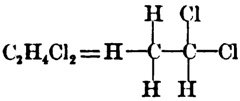


$$C_2H_5Cl = \begin{array}{ccccc} & H & & H & \\ & | & & | & \\ H- & C & - & C & -Cl \\ & | & & | & \\ & H & & H & \end{array}$$

Manufacture: Equal measures of alcohol and hydrochloric acid are distilled under pressure at 150° C. (302° F.)—$C_2H_5OH + HCl = C_2H_5Cl + H_2O$. It is a colorless, mobile fluid, with peculiar penetrating odor, burning taste, sp. gr. 0.921, boils at 12° C. (54° F.), soluble in alcohol, slightly so in water. Comes on the market in small glass tubes, vaporized by heat of the hand.

Properties and Uses.—Local anæsthetic by freezing; in minor surgical operations, dentistry, etc.

Ethylene Bichloride. Æthyleni Bichloridum.—Ethene Chloride, Dutch Liquid.

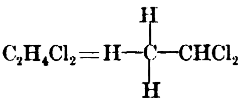


$$C_2H_4Cl_2 = \begin{array}{ccccc} & H & & Cl & \\ & | & & | & \\ H- & C & - & C & -Cl \\ & | & & | & \\ & H & & H & \end{array}$$

Manufacture: Combine equal volumes of the unsaturated hydrocarbon ethylene (C_2H_4) and chlorine (Cl_2). It is a colorless, thin, oily, volatile liquid, sweet taste, chloroform-like odor, sp. gr. 1.26, boils at 85° C. (185° F.), soluble in alcohol or ether, sparingly in water.

Properties and Uses.—Anæsthetic. Much safer than chloroform (no collapse), also more pleasant and rapid in action, causes no excitement like ether, and recovery is more rapid. It is, however, more expensive than chloroform, and irritates the throat so much that it is used with difficulty. It is very good locally in neuralgia.

Ethylidene Chloride. Di-chlor-ethane.—Mono-chlorinated Hydrochloric Ether.

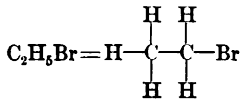


$$C_2H_4Cl_2 = \begin{array}{ccc} & H & \\ & | & \\ H- & C & -CHCl_2 \\ & | & \\ & H & \end{array}$$

This is isomeric with ethylene bichloride, which it resembles in odor; it has a density of 1.198, boils at 57.5° C. (135.5° F.), and is decomposed by sulphuric acid; it is a colorless, hot, sweet, volatile liquid of chloroformic odor.

Properties and Uses.—Anæsthetic for inhalation. Acts similarly to chloroform, but is possibly a better preparation.

Ethyl Bromide. Æthyl Bromidum.—Mono-bromo-ethane, Ether Bromatus, Hydrobromic Ether.



$$C_2H_5Br = H-\overset{H}{\underset{H}{C}}-\overset{H}{\underset{H}{C}}-Br$$

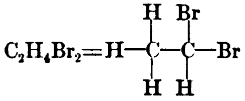
Manufacture: Distil alcohol (12) and sulphuric acid (7), gradually adding potassium bromide (12):

$$(1)\ C_2H_5OH + H_2SO_4 = C_2H_5HSO_4 + H_2O.$$
$$(2)\ C_2H_5HSO_4 + KBr = C_2H_5Br + KHSO_4.$$

It is a colorless, light, refractive, mobile, heavy liquid, very volatile, sweet warm taste, chloroform-like odor, sp. gr. 1.445–1.450, boils at 39° C. (102° F.), miscible with alcohol, chloroform, ether and oils, but not with water. Should be kept dark and in well-stoppered flasks, inasmuch as air and light decompose it into hydrobromic acid and bromine.

Properties and Uses.—Anæsthetic. It is rapid, transient, abolishing pain without loss of consciousness, depresses respiration, but is attended, as a rule, with no bad effects, as is chloroform. A few whiffs are generally sufficient to cause anæsthesia, which lasts long enough for all minor surgical operations, as opening abscesses, boils, in dentistry, etc. In administering, hold the towel close to the mouth to prevent admission of air, and put the full quantity thereupon at once, which should be ʒij–6 (8–24 Cc.). With most anæsthetics the converse is the case. Administer on empty stomach, only one minute, do not re-apply, and never use in lesions of heart, kidneys, or lungs.

Ethylene Bromide. Æthylenum Bromatum.—Brom-ethylene.



$$C_2H_4Br_2 = H-\overset{H}{\underset{H}{C}}-\overset{Br}{\underset{H}{C}}-Br$$

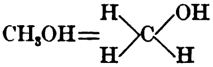
Manufacture: The unsaturated hydrocarbon ethylene (C_2H_4) is passed into bromine until saturation is effected—$C_2H_4 + Br_2 = C_2H_4Br_2$. It is a colorless, strongly refracting liquid, sweet taste, chloroformic odor, sp. gr. 2.170, boils at 132° C. (269° F.). Dose, ♏ij–5 (.13–.3 Cc.).

Properties and Uses.—In epilepsy, must not be confounded with ethyl bromide, owing to its greater poisonous properties.

II. Alcohols.

2. Oxygen Derivatives.

Methyl Alcohol. Alcohol Methylicum.—Wood Naphtha or Spirit, Pyroligneous Spirit or Alcohol.



$$CH_3OH = \begin{matrix}H\\H\end{matrix}\!>C<\!\begin{matrix}OH\\H\end{matrix}$$

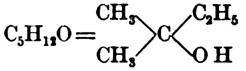
Manufacture: The aqueous portion of the distillate from the destructive distillation of wood contains 1 p. c., along with acetic acid, acetone, aldehyde, allyl alcohol, oils, etc. This lighter portion is saturated with chalk, $CaCO_3$ (forming calcium acetate), then distilled, and all that which comes over under 100° C. (212° F.) is the crude wood spirit, which has to be again rectified over $CaCl_2$ and CaO. It is a thin, colorless liquid, peculiar odor, burning taste, sp. gr. 0.802. A purified product having less odor, under the name of *Columbian Spirit* is largely used in making external remedies and those from which it is reclaimed during manufacture.

Properties and Uses.—Mostly in the arts as a substitute for (ethyl) alcohol to dissolve resins, volatile oils, alkaloids, etc.

Methylated Spirit consists of ethyl alcohol 90 p. c. + methyl alcohol 10 p. c. This is used abroad as an alcoholic solvent, owing to its being free of internal revenue tax; very poisonous.

Ethyl Alcohol. Alcohol, C_2H_5OH. (*Official.*) See page 740.

Amylene Hydrate. Di-methyl-ethyl-carbinol.—Tertiary Amyl Alcohol.



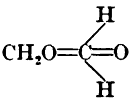
$$C_5H_{11}O = \begin{matrix}CH_3\\CH_3\end{matrix}\!>C<\!\begin{matrix}C_2H_5\\OH\end{matrix}$$

Manufacture: Impure amylene is treated with H_2SO_4, which forms amyl sulphuric acid; this is diluted, filtered, neutralized with milk of lime or liquor soda, and then fractionally distilled. It is a clear, oily liquid of a peculiar penetrating odor, resembling a mixture of camphor and peppermint, burning taste, sp. gr. 0.815, boils at 102.5° C. (216.5° F.), dissolves in 8 parts water, miscible in all proportions with alcohol, chloroform, ether, benzin, fixed oils, and glycerin; yields acetic acid on oxidation. Dose, ♏xv–45 (1–3 Cc.). May disagree with stomach, then give hypodermically.

Properties and Uses.—Hypnotic, anodyne. Has a power midway between chloral hydrate and paraldehyde. Can be given in wine, fruit, syrup, or water.

III. Aldehydes.

Formaldehyde. Formaldehydum.—Formalin, Formal, Formol.



$$CH_2O = \overset{H}{\underset{H}{C}}=O$$

Manufacture: The vapor of methyl alcohol is passed over glowing coke, by which the alcohol is oxidized chiefly into formaldehyde (gas). The aqueous solution is deprived of alcohol by distillation and concentrated until it contains 40 p. c. of formaldehyde (being then termed formalin). It is a colorless, neutral solution with a penetrating odor.

PROPERTIES AND USES.—Antiseptic, disinfectant, germicide, irritant. About equal to corrosive mercuric chloride. An ordinary room can be disinfected by 2 pints (1 L.) within an hour. As it is harmless, used also for preserving beer, wine, etc.

Paraform (Paraformaldehyde, Triformol), $(CH_2O)_3$. This is a polymeric form obtained by evaporating formaldehyde solution, and occurs as a white crystalline powder, insoluble in water. Disinfectant by heating, usually the compressed tablets; antiseptic internally and externally. Dose, gr. 5–15 (.3–1 Gm.).

Urotropine. Urotropin Hexamethylenetetramine.—Formin, Aminoform, $C_6H_{12}N_4$.

Manufacture: By passing dry ammonia gas over warm trioxymethylene (paraformaldehyde). It crystallizes from alcohol in rhombic crystals, soluble in water, is rapidly absorbed, and its value is due to its partial change into and liberation as formaldehyde in the urine. The urine is usually rendered acid, but should it remain alkaline no decomposition takes place, nor is any antiseptic action secured. Solvent for uric acid, similar to piperazine; pyelitis, cystitis, phosphaturia. Dose, gr. 5–15 (.3–1 Gm.).

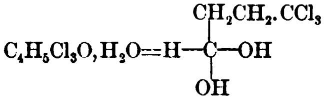
Tannoform. Methylene Ditannin, $(C_{14}H_9O_9)_2CH_2$.

Manufacture: Dissolve tannin 5 Gm., in hot water 15 Kg., add 30 p. c. formaldehyde 3 Kg., precipitate with hydrochloric acid 15 Kg., wash precipitate. There are several tannoforms, each only differing in the purified plant extract used containing the tannin. Tannoform is a light, pinkish-white powder, soluble in alcohol. Enteritis, diarrhœa, bed-sores, fetor of feet and sweat, chancres, eczema, pruritus vaginæ. Dose, gr. ½–1 (.03–.06 Gm.).

Paraldehyde. Paraldehydum, $C_6H_{12}O_3$.—(*Official.*) See page 745.

Chloral Hydrate. Chloral Hydras, C_2HCl_3O,H_2O.—(*Official.*) See page 746.

Butyl Chloral Hydrate. Butyl Chloral Hydras.—Chloral Butylicum, Croton Chloral Hydrate (misnomer), Tri-chlor-butyl-aldehyde Hydrate.



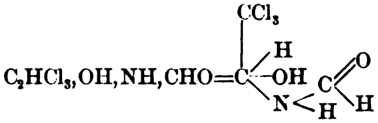
$$C_4H_5Cl_3O,H_2O=H-\overset{\overset{\displaystyle CH_2CH_2.CCl_3}{|}}{\underset{\underset{\displaystyle OH}{|}}{C}}-OH$$

Manufacture: Pass dry chlorine gas through (acetic) aldehyde, when butyl chloral, $C_4H_5Cl_3O$, is formed, which being an oil is separated by fractional distillation; this then will unite with water to form a solid hydrate, and from this solution it crystallizes in white scales of a peculiar pungent, fruit-like odor, warm, bitter, nauseous taste; it is readily soluble in alcohol, ether, hot water, and glycerin, slightly in cold water, melts at 78° C. (172° F.). Dose, gr. 5–30 (.3–2 Gm.), in pills or syrup. It is well to give gr. 3–5 (.2–.3 Gm.), every two hours until pain is relieved or sleep produced.

Incompatibles: All alkalies.

Properties and Uses.—Hypnotic. Similar to chloral hydrate, but is less certain, and by some claimed to be not as depressant to the heart. Good in facial neuralgia, migraine, headache, sick stomach, neuralgia due to decayed teeth.

Chloral Formamide. Chloralum Formamidatum.—Chloralamide.



Manufacture: Made by the interaction of 147 parts of anhydrous chloral and 45 parts of formamide at ordinary temperature, the resulting solid is purified by crystallization from 30 p. c. alcohol. It occurs in shining, colorless crystals, odorless, slightly bitter taste, soluble in alcohol, weak acid solutions, chloroform, ether, or 20 parts of water. If heated to 60° C. (140° F.), or mixed with alkalies, becomes decomposed into its components, chloral and formamide (ammonium formate), melts at 115° C. (239° F.). Dose, gr. 10–40 (.6–2.6 Gm.).

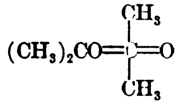
Properties and Uses.—Hypnotic. Resembles chloral hydrate, but produces no bad after-effects; by long usage the dose need not be increased, nor does it create a habit; it does not relieve pain. Good in painless insomnia, hysteria, asthma, rheumatism, spinal diseases, heart trouble, chorea. Owing to its insolubility the absorption and effect are slow, consequently it should be dissolved in alcohol, brandy, or aromatic sulphuric acid. This is one of the best medicines for seasickness. Should give a cathartic just before the voyage; when aboard ship take gr. 30 (2 Gm.) each of this and potassium bromide on an empty stomach and then go to bed.

Chloralose. Anhydro-gluco-chloral, $C_8H_{11}Cl_3O_6$.

Manufacture: Heat together equal quantities of anhydrous chloral and glucose at 100° C. (212° F.) for at least an hour, treat the cooled mass with a little water, then boil with ether, distil the ether-soluble portion with water to remove chloral, then let crystallize; yield about 3 p. c. It occurs in small colorless crystals, bitter, disagreeable taste, soluble in alcohol, ether, acetic acid, hot water, and slightly in cold water; melts at 185° C. (365° F.). Dose, gr. 5–15 (.3–1 Gm.).

Properties and Uses.—Hypnotic; free from cumulative and cardiac after-effects. Causes profound sleep, in which sensibility is not lost; owing to its great bitterness should be given in capsules or cachets. Its poisonous effect resembles very much that of chloral hydrate.

Acetone. Acetonum. Acetyl-methylid.—Dimethyl-ketone.



$$(CH_3)_2CO=\overset{CH_3}{\underset{CH_3}{C}}=O$$

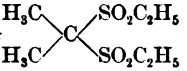
Manufacture: By the dry distillation of wood, or of acetates, or sugar (carbohydrates) + lime, or tartaric acid, or citric acid, but chiefly from calcium acetate—$Ca(C_2H_3O_2)_2$ + dry distillation = $(CH_3)_2CO + CaCO_3$, and decomposing acetic acid vapor by heat of 500–600° C. (932–1,112° F.)—$2HC_2H_3O_2$ + heat = $C_3H_6O + CO_2 + H_2O$. It is a transparent, inflammable, colorless liquid, peculiar ethereal, mint-like odor, refreshing sweetish taste; sp. gr. 0.800, boils at 56° C. (134° F.); miscible with water, alcohol, or ether in all proportions. *Impurities:* Alcohol and water, which increase the specific gravity. Dose, ♏x–20 (.6–1.3 Cc.).

Properties and Uses.—Anæsthetic, soporific, anthelmintic, rheumatism, gout; mostly used, however, as a solvent for resins, fats, oleoresins, camphor, gun-cotton, preparing chloroform, etc.

3. Sulphur Derivatives.

Sulphonal. Sulphonalum.—Di-ethyl-sulphon-dimethyl-methane; Ger. Sulfonalum, Sulfonal.

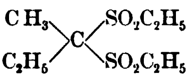
$(CH_3)_2C(C_2H_5SO_2)_2=$



Manufacture: Dry hydrochloric acid gas is passed into a mixture of 2 parts of anhydrous ethyl hydro-sulphide (mercaptan, C_2H_5SH), and 1 part of anhydrous acetone; two layers are formed, the upper being dithio-ethyl-dimethyl-methane or mercaptol; this is purified by distillation and oxidized with $KMnO_4$, thus yielding sulphonal. It occurs in white, colorless, prismatic crystals, odorless, tasteless, soluble in 450 parts water, 15 boiling water, 60 alcohol, 2 boiling alcohol, 135 ether, 3 chloroform. Dose, gr. 15–30 (1–2 Gm.).

Properties and Uses.—Hypnotic, sedative. Resembles chloral hydrate, but is less apt to affect the heart; kills, however, by paralysis of respiration; it is given for the same troubles as chloral hydrate, but being so insoluble is absorbed slowly, hence is tardy in its action; insomnia, delirium, typhoid fever, diabetes. Give an hour before bedtime in wine, beer, elixir, soup, milk, hot water, tablet or capsule.

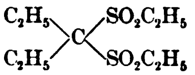
Trional. Trionalum.—Diethyl-sulphon-methyl-ethyl-methane.



Manufacture: Like sulphonal, only we start with methyl-ethyl-ketone instead of acetone. It occurs in colorless, odorless crystals, soluble in alcohol, ether, hot water, and 320 parts water; melts at 76° C. (168° F.). Dose, gr. 15–30 (1–2 Gm.).

PROPERTIES AND USES.—Hypnotic, sedative for the insane. Has prompt action without any cumulative action or tendency to create a habit; quicker and more certain than sulphonal, and largely used.

Tetronal. Tetronalum.—Diethyl-sulphon-diethyl-methane.



Manufacture: Like sulphonal, only start with diethyl-ketone instead of acetone. It is in colorless, odorless, shining plates or laminæ, soluble in alcohol, ether, hot water, and 450 parts cold water; melts at 89° C. (192° F.). Dose, gr. 15–30 (1–2 Gm.).

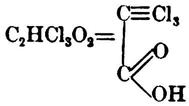
PROPERTIES AND USES.—Hypnotic. Similar to, but much less used than sulphonal and trional.

These last three compounds or sulphones depend upon the ethyl groups for hypnotic effects, the greater the number the more powerful the action.

IV. Acids.

Acetic Acid. Acidum Aceticum, $C_2H_4O_2$.—(*Official.*) See page 751.

Tri-chlor Acetic Acid. Acidum Tri-chloraceticum.—Chloracetic Acid.



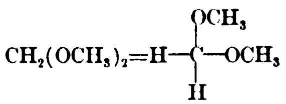
Manufacture: Oxidize 1 part of chloral hydrate with 3 parts nitric acid by mixing the two, now expose the mixture to the sunlight for several days to get rid of all red fumes, then distil. It occurs in colorless rhombohedric crystals, deliquescent, slight pungent odor, strong acid reaction, soluble in water, alcohol, or ether; melts at 51° C. (125° F.), boils at 195° C. (383° F.).

PROPERTIES AND USES.—Antiseptic, escharotic. Penetrates deeply, but causes less pain than either silver nitrate, zinc chloride, or caustic potash. Removes warts, condylomata, lupus, diseases of the nose and throat; used here in preference to chromic acid.

Lactic Acid. Acidum Lacticum, $C_3H_6O_{,3}$.—(*Official.*) See page 756.

V. Ethers.

Methylal.—Methylene-dimethyl Ether.



$$CH_2(OCH_3)_2=H-\overset{\displaystyle OCH_3}{\underset{\displaystyle H}{C}}-OCH_3$$

Manufacture: Distil together methyl alcohol, sulphuric acid, and manganese dioxide, by which process the methyl alcohol is oxidized; caustic potash may be added to the distillate to separate the methyl formate. This is a mobile, colorless, volatile liquid, odor like chloroform and acetic ether, burning, aromatic taste, soluble in alcohol, ether, oils, and 3 parts water, sp. gr. 0.855, boils at 42° C. (107.6° F.). Dose, ♏xxx–90 (2–6 Cc.), in emulsion, or syrup and water.

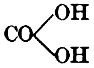
PROPERTIES AND USES.—Anæsthetic, hypnotic, narcotic; asthma, colic, angina, tetanus.

Ethyl Ether. Æther.—Ethyl Oxide, $(C_2H_5)_2O$. (*Official.*) See page 757.

Ethyl Nitrite. Nitrous Ether, $C_2H_5NO_2$.—(*Official.*) See page 759.

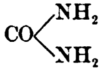
Amyl Nitrite. Amyl Nitris, $C_5H_{11}NO_2$.—(*Official.*) See page 760.

4. UREA DERIVATIVES.



$CO\begin{matrix}\diagup OH\\ \diagdown OH\end{matrix}$

Carbonic Acid

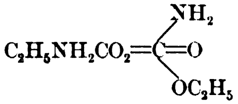


$CO\begin{matrix}\diagup NH_2\\ \diagdown NH_2\end{matrix}$

Carbamide

Urea (carbamide) is carbonic acid with its two hydroxyls replaced by two ammonia residues, NH_2, as shown above.

Urethane. Urethanum.—Ethyl Urethane, Ethyl Carbamate.

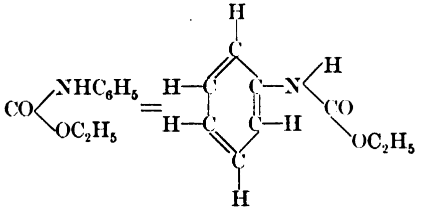


$C_2H_5NH_2CO_2 = \overset{NH_2}{\underset{OC_2H_5}{C}}{=}O$

Manufacture: Heat together urea nitrate and ethyl alcohol for several hours in a steam digester at 120–130° C. (248–266° F.). The resulting crystalline mass is dissolved in water, shaken with ether, ethereal solution distilled and allowed to crystallize; purified by recrystallizing from water. It is in colorless, odorless crystals, with saltpetre-taste, soluble in alcohol, chloroform, ether, water, glycerin, or fixed oils; melts at 47–50° C. (116–122° F.), boils at 170–180° C. (338–356° F.), and decomposes when heated with acids or alkalies. Dose, gr. 10–40 (.6–2.6 Gm.).

PROPERTIES AND USES.—Hypnotic, without bad after-effects.

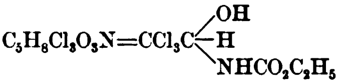
Euphorin. Phenyl Urethane.



Manufacture: By the interaction of chlor-ethyl-formate and aniline. It is a white crystalline powder, faint aromatic odor, clove-like aftertaste, soluble in alcohol, ether, hydro-alcoholic solutions. Dose, gr. 2–10 (.13–.6 Gm.).

PROPERTIES AND USES.—Antipyretic, analgesic, anti-rheumatic; as a substitute for iodoform.

Ural. Uralium.—Chloral Urethane, Uraline.

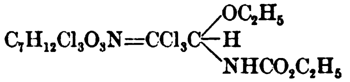


$$C_5H_8Cl_3O_3N=CCl_3C\begin{cases}OH\\H\\NHCO_2C_2H_5\end{cases}$$

Manufacture: Mix together chloral hydrate and urethane, by adding HCl they unite into a solid, insoluble in cold water, treat with H_2SO_4, wash with water; it is decomposed by hot water into its two components, soluble in alcohol or ether. Dose, gr. 10–40 (.6–2.6 Gm.).

PROPERTIES AND USES.—Hypnotic; cough, angina, insomnia.

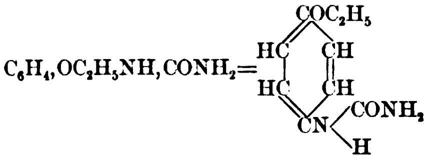
Somnal. Ethylated Chloral Urethane.



$$C_7H_{12}Cl_3O_3N=CCl_3C\begin{cases}OC_2H_5\\H\\NHCO_2C_2H_5\end{cases}$$

This is an alcoholic solution of ural, or a union of alcohol, chloral hydrate, and urethane. It is hypnotic in doses ♏x–40 (.6–2.6 Cc.).

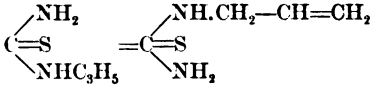
Sucrol. Dulcin.—Para-phenetol-carbamide, Para-ethoxy-phenyl Urea.



$C_6H_4,OC_2H_5NH,CONH_2=$

Manufacture: Act upon para-phenetidine, with carbonyl chloride to form dipara-phenetol-carbamide; heat this in steam digester with urea to 160° C. (320° F.). It crystallizes from water in shining needles, sweet taste, soluble in 150 parts hot water, 800 cold water, 25 alcohol. It is 200 times sweeter than sugar, for which it is used in diabetes.

Thiosinamin. Allyl-thio-urea.—Allyl-sulpho-urea.



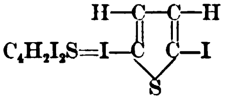
$$C\begin{cases}NH_2\\=S\\NHC_3H_5\end{cases}\quad =C\begin{cases}NH.CH_2—CH=CH_2\\=S\\NH_2\end{cases}$$

Manufacture: Act on allyl-sulphocyanate (mustard oil, C_3H_5CNS) with ammonia. Occurs in colorless, rhombic crystals, bitterish, soluble in water, alcohol, ether, melts at 74° C. (165° F.), garlic odor. Dose, gr. ½–7 (.03–.5 Gm.), by injection, repeated every 3–4 days. Poisonous.

PROPERTIES AND USES.—Inject subcutaneously for lupus, tuberculous diseases; causes absorption of exudate, corneal opacities.

5. THIOPHENE DERIVATIVES = C_4H_4S.

Thiophene-Di-iodide.—Di-iodo-thiophene.



$C_4H_2I_2S=$

Manufacture: By the action of iodine on thiophene (C_4H_4S, a product from benzene) in the presence of mercuric oxide. It is in colorless, volatile crystals, aromatic odor, soluble in ether, chloroform, hot alcohol, insoluble in water; melts at 40.5° C. (104.9° F.); contains 75.5 p. c. iodine, and 9.5 p. c. sulphur.

PROPERTIES AND USES.—Antiseptic. As a substitute for iodoform.

Sodium Thiophene-sulphonate, C_4H_3S,SO_3Na. This is a white crystalline powder, containing 33 p. c. sulphur, with a feeble, diagreeable odor, and used identically as the preceding.

AROMATIC (BENZENE) SERIES, C_6H_6.

(CLOSED-CHAIN COMPOUNDS.)

6. TERPENES.

Terebene. Terebenum, $C_{10}H_{16}$.—(*Official.*) See pages 68–69.

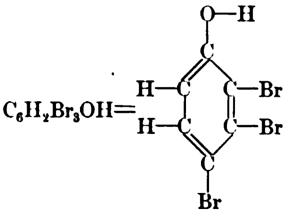
Terpin Hydrate. Terpini Hydras, $C_{10}H_{16}3H_2O$.—(*Official.*) See pages 68–69.

7. PHENOL DERIVATIVES.

Phenol. Acidum Carbolicum, C_6H_5OH.—(*Official.*) See page 761.

Menthol. Menthol, $C_{10}H_{20}O$.—(*Official.*) See pages 485–486.

Bromol. Tri-bromo-phenol.—Tri-brom-phenol.

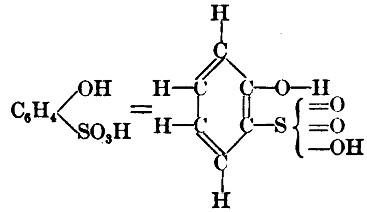


$C_6H_2Br_3OH=$

Manufacture: Act on phenol with bromine, thus $C_6H_5OH + 6Br = C_6H_2Br_3OH + 3HBr$. It is a colorless, crystalline powder, soluble in alcohol, chloroform, ether, fixed or volatile oils, insoluble in water; melts at 95° C. (203° F.); odor unpleasant, taste sweetish, astringent. Dose, gr. 1–8 (.06–.5 Gm.).

PROPERTIES AND USES.—Antiseptic, disinfectant, caustic; tuberculous ulcers, gangrene, diphtheria, cholera infantum.

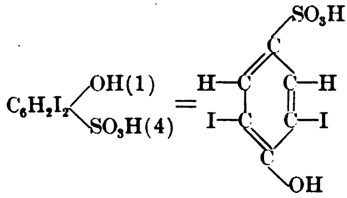
Aseptol. Ortho-phenol Sulphonic Acid.—Sozolic Acid, Sulpho-(carbol) phenol.



Manufacture: Mix phenol and sulphuric acid at a very low temperature, allowing to stand several days; this product is purified by converting it into the barium salt and precipitating barium with H_2SO_4. It is a solution containing 33 p. c. ortho-phenol-sulphonic acid, having a sour taste, acid reaction and phenol-odor.

PROPERTIES AND USES.—Antiseptic. Like carbolic acid, but possesses only one-third its antiseptic power.

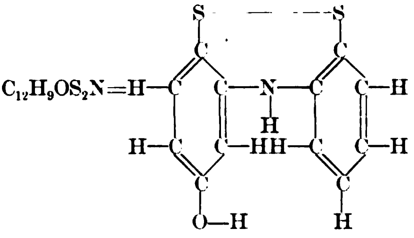
Sozoiodol. Sozoiodolic Acid.—Di-iodo-para-phenyl-sulphonic acid.



Manufacture: Phenol (2 parts) and sulphuric acid (1) are heated together for 3 days at 110° C. (230° F.), forming para-phenol-sulphonic acid, and this is treated with iodine. It crystallizes from water in needle-shaped prisms that are soluble in alcohol or water.

PROPERTIES AND USES.—Antiseptic in 2–3 p. c. solution. The metallic salts which this acid forms are good substitutes for iodoform, those with sodium being preferred.

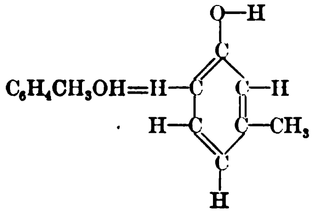
Sulphaminol. Thio-oxy-diphenylamine.



Manufacture: Boil together meta-oxy-diphenylamine, caustic soda, and sulphur, treat filtered solution with ammonium chloride. It occurs as a yellow, odorless, tasteless powder, soluble in alkalies, insoluble in water; melts at 155° C. (311° F.).

PROPERTIES AND USES.—Antiseptic. As a substitute for iodoform.

Cresol. Cresylic Acid.—Meta-cresol, Kresylol.

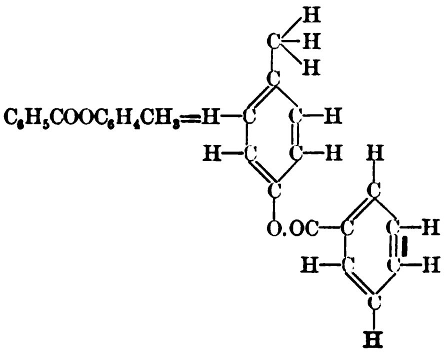


$C_6H_4CH_3OH=$

Manufacture: This is a product of coal-tar distillation at 201° C. (394° F.), being associated along with phenol. It is a colorless liquid, creosote-odor, soluble in alcohol, ether, or glycerin, slightly in water. There are two other isomeric cresols—ortho-cresol, para-cresol.

Properties and Uses.—Antiseptic, germicide; less poisonous than carbolic acid.

Benzo-para-cresol. Para-cresyl-benzoate.



$C_6H_5COOC_6H_4CH_3=$

Manufacture: Benzoyl chloride is allowed to act on the sodium salt of para-cresol. It is in colorless needles, soluble in chloroform, ether, hot water, insoluble in water; melts at 71° C. (160° F.).

Properties and Uses.—Antiseptic. The preparations creolin, lysol, saprol, solutol, solveol, sozal, etc., are but complex mixtures of the three cresols—ortho, meta, para.

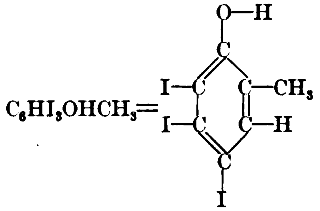
Creolin. Creolinum.—This is claimed to be an emulsion of cresol with resin soap, but can be obtained by freeing coal-tar product (180–220° C.; 356–428° F.) from carbolic acid. It is a dark-brown, syrupy, alkaline liquid, containing in solution the higher homologues of phenol; forms with water a milky mixture, with characteristic odor; soluble in alcohol, ether, or chloroform. Dose, ♏j–5 (.06–.3 Cc.).

Properties and Uses.—Antiseptic, sedative; it is powerful but non-irritating. Used as a substitute for carbolic acid, anti-fermentative. Internally, for gastric fermentation, dysentery, typhoid fever, cholera, cystitis, phthisis. Externally, for scabies, gonorrhœa, ulcers. Should be applied in solution (2 p. c.), or ointment or soap (10 p. c.).

Lysol. Lysolum.—Made by reserving distillate from the coal-tar oil that comes over between 190–200° C. (374–392° F.), which is then boiled in fat until dissolved, then saponified with alcohol (or alkali). It is a brown, oily-looking, clear liquid, aromatic odor resembling creosote; contains 50 p. c. of cresol; it is soluble in water, forming clear, frothing, saponaceous liquid, also in alcohol, chloroform, or glycerin.

PROPERTIES AND USES.—Antiseptic in surgery, gynecology. It is five times stronger, but only one-eighth as poisonous as carbolic acid, and one-half that of creolin. Good in skin diseases, lupus, diphtheria, gargle for foul breath. Should be applied in aqueous solution (1–3 p. c.).

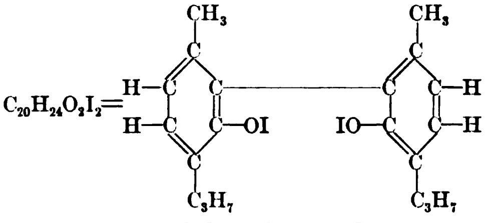
Losophane. Tri-iodo-meta-cresol.



Manufacture: Iodine is allowed to act upon an alkaline solution of oxy-para-toluic acid. It is in colorless, odorless needles, slightly acid, soluble in benzene, chloroform, ether, dilute NaOH, slightly in alcohol, insoluble in water, decomposed by strong caustic soda; melts at 122° C. (251° F.), and contains iodine 78.39 p. c.

PROPERTIES AND USES.—Antiseptic. In parasitic skin troubles eczema, prurigo. Apply in 1–2 p. c. solutions of alcohol 3 vols. + water 1, or in 1–10 p. c. ointments of vaseline or lanolin.

Aristol. Aristolum.—Di-thymol-di-iodide, Annidalin.



Manufacture: Potassium iodide is dissolved in solution of iodine, and thymol is dissolved in a 12 p. c. solution of NaOH, the two solutions are mixed, the precipitate washed and dried; contains 45.8 p. c. of iodine. It is an amorphous, brownish-red, nearly tasteless powder, slight iodine-odor, soluble in ether, chloroform, collodion, fixed oils, petrolatum, insoluble in water, nearly insoluble in alcohol.

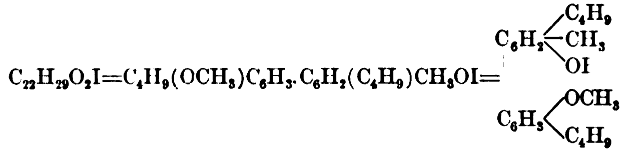
PROPERTIES AND USES.—Antiseptic. Similar to and a substitute for iodoform in skin diseases, lupus, psoriasis, tertiary syphilis. Apply in powder or ointment, with lanolin, flexible collodion, etc.

Ichthyol. Ichthyolum.—Ammonium-sulpho-ichthyolate, $C_{28}H_{36}S_3O_6(NH_4)_2$.

Manufacture: This is a crude oil obtained by the destructive distillation of a European bituminous rock filled with petrified fossil remains of fish and other animals. This oil when saturated with H_2SO_4 becomes heated to 100° C. (212° F.), forming ichthyol-sulphonic acid with evolution of SO_2; treat now with NaOH (or NaCl) solution to remove H_2SO_3 and H_2SO_4, saturate residue with ammonia. It is a viscous, reddish-brown syrupy liquid, bituminous odor and taste, soluble in water, glycerin, fats. Dose, gr. 10–20 (.6–1.3 Gm.), ter die. *Sodium-sulpho-ichthyolate* is the most important salt for administering in pill-form, although we have the corresponding salts of lithium, zinc, and mercury. All of these are obtained by saturating the acid with the respective oxides or carbonates.

PROPERTIES AND USES.—Alterative, anodyne discutient; chronic rheumatism, gout, lepra, eczema, urticaria, acne, intertrigo, lupus, ulcers, lymphatic enlargements, burns, frost-bites, sprains, contusions, psoriasis, prostatitis. Give in pill, or apply ointment (20–50 p. c.) with lanolin.

Europhen. Di-iso-butyl-ortho-cresol-iodide.

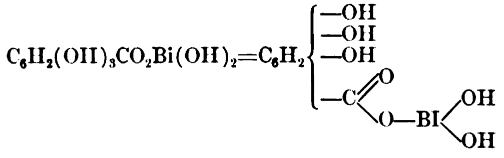


$$C_{22}H_{29}O_2I = C_4H_9(OCH_3)C_6H_3.C_6H_2(C_4H_9)CH_3OI = \begin{array}{l} C_6H_2\begin{cases} C_4H_9 \\ CH_3 \\ OI \end{cases} \\ C_6H_3\begin{cases} OCH_3 \\ C_4H_9 \end{cases} \end{array}$$

Manufacture: This is made like aristol, but iso-butyl-ortho-cresol is used instead of thymol. It is an amorphous golden-yellow powder, saffron-like odor, five times as bulky as iodoform, soluble in alcohol, ether, chloroform, 4 parts olive oil, insoluble in water or glycerin; melts at 110° C. (230° F.), forming a clear brown liquid; contains iodine 28 p. c. Dose, gr. ½–2 (.03–.13 Gm.).

PROPERTIES AND USES.—Antiseptic, germicide, bactericide. Possesses about the same power, and used like iodoform for wounds, ulcers, burns, psoriasis, eczèma, lupus, chancres, rhinitis, in ointment.

Bismuth Subgallate. Dermatol.

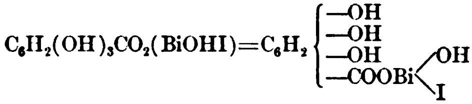


$$C_6H_2(OH)_3CO_2Bi(OH)_2 = C_6H_2\begin{cases} -OH \\ -OH \\ -OH \\ -C\begin{cases} =O \\ -O-BI\begin{cases} OH \\ OH \end{cases} \end{cases} \end{cases}$$

Manufacture: Dissolve bismuth subnitrate 15 parts, in glacial acetic acid 30, adding water 200–250, filtering; to filtrate, constantly stirring, add aqueous solution gallic acid (5+250), wash precipitate by decantation, dry. It is an impalpable yellowish-white powder, odorless, permanent, insoluble in ordinary solvents. Dose, gr. 5–30 (.3–2 Gm.).

PROPERTIES AND USES.—Antiseptic. Like iodoform, but has sedative, astringent, drying and anti-bacterial effects upon wounds, ulcers, eczemas; fermentative dyspepsia, diarrhœa of tuberculosis and typhoid fever; apply in powder, ointment (1+10 vaseline), and gauze (10 p. c.).

Bismuth Oxyiodogallate. Airol.



$$C_6H_2(OH)_3CO_2(BiOHI)=C_6H_2\left\{\begin{array}{l}-OH\\-OH\\-OH\\-COOBi\begin{smallmatrix}OH\\I\end{smallmatrix}\end{array}\right.$$

Manufacture: By combining basic bismuth, oxygen and iodine. It is a grayish-green, odorless, tasteless powder, turning red by moisture, thereby losing iodine; contains Bi_2O_3 44.5 p. c., iodine 24.8 p. c. PROPERTIES AND USES.—Antiseptic; good substitute for iodoform; abscesses, burns, chancres, metritis, rhinitis, vaginitis, ulcers; in powder, ointment (10–20 p. c.) with lard, vaselin, glycerin.

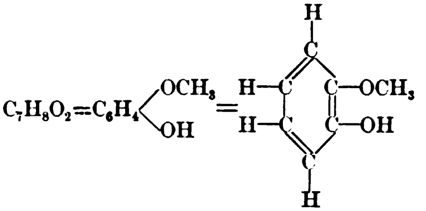
Bismuth Subsalicylate, $Bi(C_7H_5O_3)_3Bi_2O_3$.
Manufacture: Dilute a glycerin solution of crystallized bismuthous nitrate with water, and decompose with strong aqueous solution of sodium salicylate; contains Bi_2O_3 76 p. c., salicylic acid 24 p. c. Intestinal antiseptic; diarrhœa. Dose, gr. 5–15 (.3–1 Gm.).

Bismuth Tribromophenol, Xeroform, $(C_6H_2Br_3O)_2BiOH + Bi_2O_3$.
Manufacture: By combining chemically equal quantities of bismuth and tribromphenol. It is a yellowish-green, odorless, tasteless, insoluble powder; contains Bi_2O_3 50 p. c. Intestinal antiseptic; acute and chronic enteritis, burns, infected wounds, ulcers; in place of iodoform.

Antiseptin. Boro-thymol Zinc Iodide.
Manufacture: This is a mixture of zinc sulphate 85 parts, zinc iodide 2.5, thymol 2.5, boric acid 10. Antiseptic for wounds, ulcers, etc.

8. DI-HYDROXY PHENOL DERIVATIVES.

Guaiacol. Guaiacolum.—Methyl Pyrocatechin, Mono-methyl Ether, Pyrocatechin (Catechol)-Mono-methyl Ether.



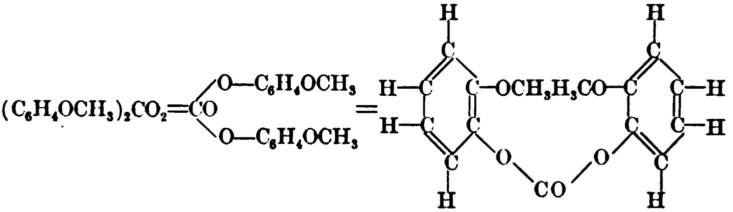
$$C_7H_8O_2=C_6H_4\begin{smallmatrix}OCH_3\\OH\end{smallmatrix}$$

Manufacture: Distil fractionally beech-wood-tar creosote at 200–205° C. (392–401° F.); treat this portion with ammonia to remove acid compounds, again distil. It is a liquid constituting 60–90 p. c. of official creosote (which is mainly composed of this and creosol); colorless, refractive, aromatic, sp. gr. 1.117, soluble in alcohol, ether, slightly in water, boils at 202° C. (395° F.). Dose, ♏ij–10 (.13–.6 Cc.).

PREPARATIONS.—1. *Guaiacoli Benzoas.* Guaiacol Benzoate, Benzosol, Benzoyl Guaiacol, $C_6H_4OHC_6H_5CO_2$.
Manufacture: Act on the potassium salt of guaiacol with benzoyl chloride. It is a colorless crystalline powder, odorless, tasteless,

soluble in alcohol, chloroform, ether, insoluble in water; melts at 56° C. (133° F.); alcoholic potash saponifies it, sulphuric acid turns it lemon-yellow, but ferric chloride produces no color in alcoholic solutions. Dose, gr. 5–30 (.3–2 Gm.).

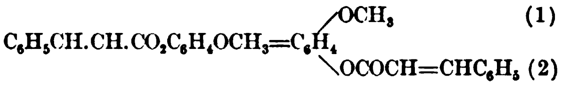
2. *Guaiacoli Carbonas.* Guaiacol Carbonate.



$$(C_6H_4OCH_3)_2CO_2=CO\begin{cases}O-C_6H_4OCH_3\\ O-C_6H_4OCH_3\end{cases}=$$

Manufacture: Act on the sodium salt of guaiacol with carbonyl chloride ($COCl_2$). It is a white, crystalline neutral powder, nearly odorless, tasteless, soluble in alcohol, chloroform, ether, sparingly in glycerin, fatty oils, insoluble in water; melts at 82° C. (180° F.). Dose, gr. 5–30 (.3–2 Gm.).

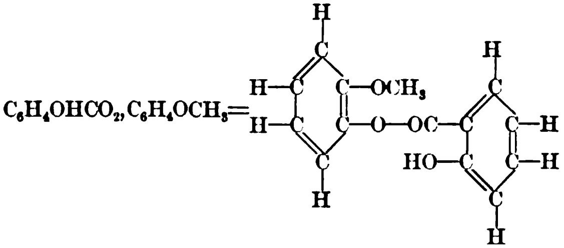
3. *Guaiacoli Cinnamas.* Guaiacol Cinnamate, Styracol, Cinnamyl Guaiacol.



$$C_6H_5CH.CH.CO_2C_6H_4OCH_3=C_6H_4\begin{cases}OCH_3 & (1)\\ OCOCH=CHC_6H_5 & (2)\end{cases}$$

Manufacture: Act on guaiacol with cinnamyl-chloride by heating on water-bath, crystallize from boiling alcohol. It is in white needle crystals, soluble in ether, chloroform, insoluble in water. Dose, gr. 2–10 (.13–.6 Gm.).

4. *Guaiacoli Salicylas.* Guaiacol Salicylate, Guaiacol Salol.

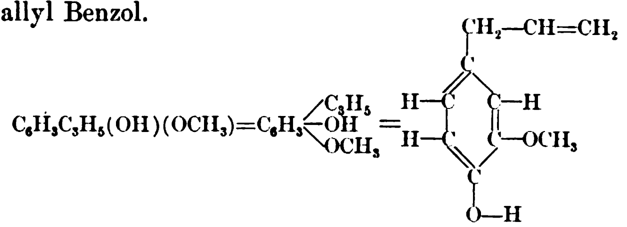


$$C_6H_4OHCO_2,C_6H_4OCH_3=$$

Manufacture: Act on a mixture of sodium-guaiacol and salicylate with phosphorus oxychloride. It is a white, crystalline powder, analogous to salol, soluble in alcohol, chloroform, ether, insoluble in water. Dose, gr. 5–30 (.3–2 Gm.).

PROPERTIES AND USES.—For the same purpose as creosote, but is less valuable, it is also less irritating to the intestinal canal and kidneys; phthisis, external tubercle, lupus, cough, expectoration, antiseptic. The benzoate splits in the system into guaiacol and benzoic acid, and so possibly do the other salts go into their original components; the cinnamate good in gleet, vesical catarrh, diarrhœa.

Eugenol. Eugenic Acid.—Caryophyllic Acid, Para-oxy-meta-methoxyallyl Benzol.


$C_6H_3C_3H_5(OH)(OCH_3)=C_6H_3\left\langle\begin{matrix}C_3H_5\\OH\\OCH_3\end{matrix}\right.$

Manufacture: While this is a constituent of the essential oils of cloves, cinnamon, bay, allspice, sassafras, etc., by oxidation, it is also made artificially from phenol by a patented process. It is an aromatic liquid, soluble in alcohol, slightly in water, boils at 247° C. (477° F.). Dose, ♏v–15 (.3–1 Cc.), ter die.

PROPERTIES AND USES.—Febrifuge, antiseptic.

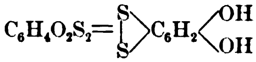
Eugenol Acetamide, $C_{10}H_{11}O_2,COCH_2NH_2$.

Manufacture: Act on chloracetic acid with the sodium salt of eugenol, producing eugenol acetic acid; this being changed to the ethyl ester is treated with alcoholic ammonia, giving thus the amide. It crystallizes in fine needles, melts at 110° C. (230° F.).

PROPERTIES AND USES.—Anæsthetic, antiseptic, similar to cocaine; dentistry, etc.

Resorcinum. Resorcin.—Resorcinol, Meta-di-hydroxy-benzene. (*Official.*) See page 764.

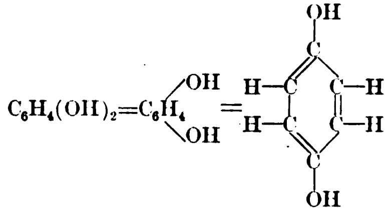
Thioresorcin.


$C_6H_4O_2S_2=\left[\begin{matrix}S\\S\end{matrix}\right]C_6H_2\left\langle\begin{matrix}OH\\OH\end{matrix}\right.$

Manufacture: Heat resorcin (1), sodium hydroxide (3), and sulphur (3) with water until solution effected, acidify the solution to get flocculent precipitate, dry. It is a yellowish, amorphous powder, soluble in alkalies, carbonates, and sulphides, insoluble in ordinary reagents.

PROPERTIES AND USES.—Antiseptic, similar but inferior to iodoform.

Hydroquinone. Hydrochinone. Quinol.—Hydroquinol, Para-di-hydroxy-benzene.


$C_6H_4(OH)_2=C_6H_4\left\langle\begin{matrix}OH\\OH\end{matrix}\right.$

Manufacture: Oxidize aniline with potassium dichromate and sulphuric acid, then reduce the resulting quinone ($C_6H_4O_2$) with acid sodium sulphite (sulphurous acid). It crystallizes from water in hexagonal prisms, which heated sublimes undecomposed, soluble in alcohol, ether, hot water, slightly in cold water, melts at 169° C. (336° F.), it reduces $AgNO_3$ solution on warming, and Fehling's solution at ordinary temperature. Dose, gr. 10–20 (.6–1.3 Gm.).

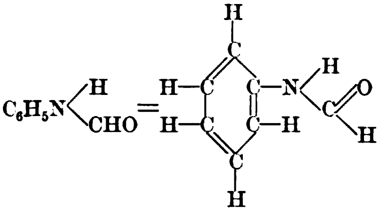
Properties and Uses.—Antipyretic, antiseptic; fevers of phthisis and pneumonia.

Pyrogallol. Pyrogallic Acid.—Tri-hydroxy-benzene, $C_6H_6O_3$. (*Official.*) See page 152.

9. Benzene Derivatives containing Nitrogen. Amido Derivatives.

The best known amine of this series is aniline, $C_6H_5NH_2$. Here the ammonia residue, NH_2, replaces one hydrogen in benzene (C_6H_6). These hydrogen atoms in NH_2 may be replaced by hydrocarbon or acid residues.

Formanilid. Formanilidum.—Phenylformamide.



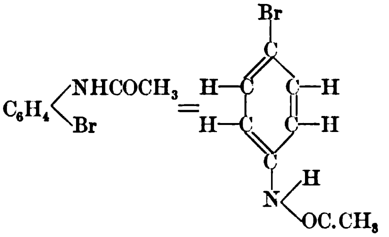
$C_6H_5N\begin{cases}H\\CHO\end{cases}$

Manufacture: Distil a mixture of aniline and oxalic acid (formic acid)—$C_6H_5NH_2 + H_2C_2O_4 = C_6H_5NHCOH + CO_2 + H_2O$. It is in colorless prismatic needles or crystals, soluble in alcohol, partially in water, melts at 46° C. (115° F.), dilute acids decompose it into aniline and formic acid. Dose, gr. 2–5 (.13–.3 Gm.).

Properties and Uses.—Antipyretic, anti-neuralgic, analgesic.

Acetanilidum. Acetanilid.—Antifebrin, C_8H_9NO. (*Official.*) See page 768.

Antisepsin. Asepsin.—Acetbromanilid, Para brom-acetanilid.

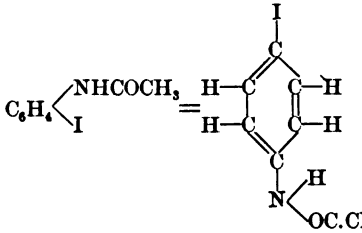


$C_6H_4\begin{cases}NHCOCH_3\\Br\end{cases}$

Manufacture: To a solution of acetanilid in acetic acid add bromine. The product is purified by crystallization from alcohol. It is in colorless, monoclinic prisms, soluble in alcohol, insoluble in water, melts at 166° C. (331° F.). The ortho-compound is more soluble in alcohol, melts at 99° C. (210° F.). Dose, gr. 3–8 (.2–.5 Gm.), ter die.

PROPERTIES AND USES.—Antiseptic, antipyretic, analgesic; typhoid fever, pneumonia, phthisis; locally to wounds, bites.

Iodo-acetanilid. Iodo-antifebrin.—Para-iodo-acetanilid.

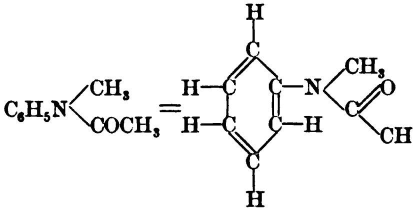


$$C_6H_4\begin{matrix}\diagup NHCOCH_3\\ \diagdown I\end{matrix}=$$

Manufacture: Heat together acetic acid and para-iodo-aniline. It is in colorless, rhombic tablets, odorless, tasteless, soluble in alcohol, acetic acid, hot water, slightly in cold water, melts at 181° C. (358° F.). Dose, gr. 1–5 (.06–.3 Gm.).

PROPERTIES AND USES.—Antipyretic, analgesic, anodyne.

Methyl-acetanilid. Exalgin.

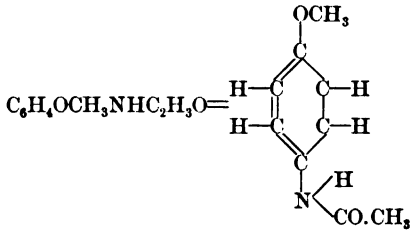


$$C_6H_5N\begin{matrix}\diagup CH_3\\ \diagdown COCH_3\end{matrix}=$$

Manufacture: Act on mono-methyl-aniline $\left(C_6H_5N\begin{matrix}\diagup CH_3\\ \diagdown H\end{matrix}\right)$ with acetyl-chloride. It is in needles, or in long tablet-like crystals, soluble in alcohol, slightly so in water, melts at 102° C. (215° F.). Dose, gr. 1–5 (.06–.3 Gm.).

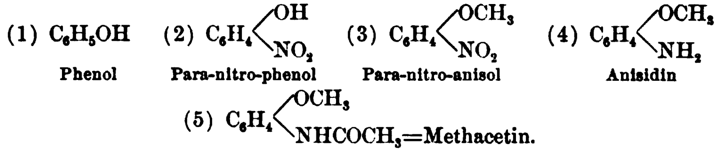
PROPERTIES AND USES.—Anti-neuralgic, analgesic, antiseptic; neuralgia, chorea, rheumatism, sciatica, superior to antipyrine.

Methacetin. Para-acetanisidin.—Para-oxy-methyl-acetanilid.



$C_6H_4OCH_3NHC_2H_3O=$

Manufacture: by the following steps :



$$(1)\ C_6H_5OH \quad (2)\ C_6H_4\Big\langle\begin{array}{l}OH\\NO_2\end{array} \quad (3)\ C_6H_4\Big\langle\begin{array}{l}OCH_3\\NO_2\end{array} \quad (4)\ C_6H_4\Big\langle\begin{array}{l}OCH_3\\NH_2\end{array}$$

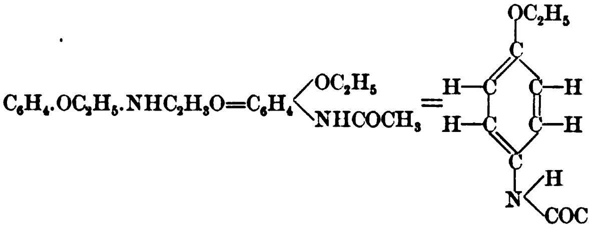
Phenol Para-nitro-phenol Para-nitro-anisol Anisidin

$$(5)\ C_6H_4\Big\langle\begin{array}{l}OCH_3\\NHCOCH_3\end{array}=\text{Methacetin.}$$

This is the closest rival of phenacetin; occurs in colorless, odorless scales, soluble in alcohol, acetone, glycerin, fatty oils, slightly in water, benzene, and ether. Dose, gr. 2–8 (.13–.5 Gm.).

PROPERTIES AND USES.—Antipyretic; typhoid, rheumatism.

Phenacetin. Phenacetinum.—Para-acetphenetidin, Para-oxyethylacetanilid.



$$C_6H_4.OC_2H_5.NHC_2H_3O=C_6H_4\Big\langle\begin{array}{l}OC_2H_5\\NHCOCH_3\end{array}=$$

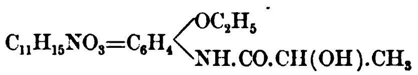
Manufacture: Similar to methacetin. Phenol, C_6H_5OH, is converted by HNO_3 into nitrophenol, $C_6H_4NO_2OH$; distil off the orthonitrophenol, treat the remaining para-nitrophenol, as a sodium compound, with either ethyl bromide, chloride or iodide, giving ethyl paranitrophenol or paranitrophenetol, which by sodium amalgam (or nascent hydrogen, or hydrochloric acid and iron filings) is reduced to paraphenetidin, $C_6H_4NH_2OC_2H_5$; into this glacial acetic acid introduces the acetyl group, giving phenacetin—$C_6H_4NH_2OC_2H_5 + HC_2H_3O_2 = C_6H_4OC_2H_5NHC_2H_3O + H_2O$. It is in colorless, odorless, tasteless, scaly crystals, soluble in glycerin, 16 parts alcohol, sparingly in water (1 in 1,400), melts at 135° C. (275° F.). Dose, gr. 3–10 (.2–.6 Gm.).

PROPERTIES AND USES.—Antipyretic, analgesic, cardiac depressant, diuretic, safer than antipyrine or acetanilid; neuralgia, sciatica, locomotor ataxia, migraine, headaches, hysteria, asthma, whooping-cough, epilepsy, rheumatism, chronic myelitis, arthritis, cystitis, metritis, acute neuritis, pleurisy, dysmenorrhœa. For any paroxysm of headache, etc., give gr. 3 (.2 Gm.) every hour until three or four doses are taken.

Poisoning: Excessive quantity may produce vomiting, sweating, feeble and rapid pulse, collapse; treat as in acetanilid, with alcoholic stimulants, strychnine hypodermically, warmth externally, etc.

Methyl Phenacetin, $C_6H_4OC_2H_5CH_3C_2H_3O$, and Ethyl Phenacetin, $C_6H_4OC_2H_5C_2H_5C_2H_3O$, are also hypnotics, the former being the stronger.

Lactophenin. Lactopheninum.—Lactyl-phenetidine.

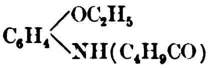


$$C_{11}H_{15}NO_3=C_6H_4\Big\langle\begin{array}{l}OC_2H_5\\NH.CO.CH(OH).CH_3\end{array}$$

Manufacture: Allow lactic acid to act on phenetidine in the presence of dehydrating substances. It is more soluble than phenacetin, and differs from it only in using lactic instead of acetic acid; occurs as a bitter, odorless, crystalline powder, soluble in 9 parts alcohol, 320 water, melts at 118° C. (244° F.). Dose, gr. 8–15 (.5–1 Gm.).

PROPERTIES AND USES.—Antipyretic, sedative, analgesic, hypnotic (between sulphonal and urethane); better tolerated than antipyrine, occasioning neither collapse nor cyanosis; rheumatism, pneumonia, typhoid and scarlet fevers, influenza, septicæmia.

Sedatin. Para-valeryl-amido-(phenetol) phenetidin.

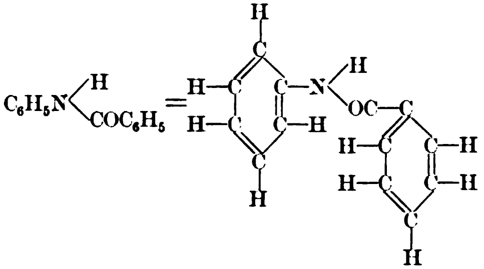


$$C_6H_4\begin{cases}OC_2H_5\\NH(C_4H_9CO)\end{cases}$$

Manufacture: Act on para-amido-phenetol with valerianic acid or valeryl chloride. It crystallizes in needles, slightly soluble in acetone, chloroform, ether, insoluble in water. Dose, gr. 1–5 (.06–.3 Gm.).

PROPERTIES AND USES.—Resembles antipyrin; sedative, anti-neuralgic.

Benzanilid. Benzoyl-anilid.—Phenylbenzamid.



$$C_6H_5N\begin{cases}H\\COC_6H_5\end{cases} =$$

Manufacture: Act on aniline with benzoyl chloride in the presence of caustic soda. It is in colorless scales, soluble in 58 parts of cold, 7 of hot alcohol, insoluble in water; melts at 162° C. (324° F.).

This bears the same relation to benzoic acid that acetanilid does to acetic acid. Dose, gr. 2–8 (.13–.5 Gm.); children gr. 1–5 (.06–.3 Gm.).

PROPERTIES AND USES.—Antipyretic, especially in fevers of children.

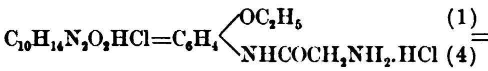
Gallanilid. Gallanol.—Gallinol.

$$C_6H_5NH,CO,C_6H_2(OH)_3$$

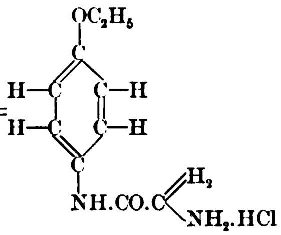
Manufacture: By heating aniline to 150° C. (302° F.), for an hour with tannic or gallic acid ($C_6H_2(OH)_3COOH$); the resulting product is now purified by crystallization from diluted alcohol. In colorless, bitter crystals, when free from water melts at 205° C. (401° F.), soluble in hot water, alcohol, ether, or alkalies, slightly in cold water.

PROPERTIES AND USES.—Chiefly externally for skin troubles, instead of chrysarobin.

Phenocoll Hydrochloride. Phenocollum Hydrochloridum.—Glycocoll-para-phenetidin-Hydrochloride.



$$C_{10}H_{14}N_2O_2HCl = C_6H_4\begin{cases} OC_2H_5 & (1) \\ NHCOCH_2NH_2.HCl & (4) \end{cases} =$$

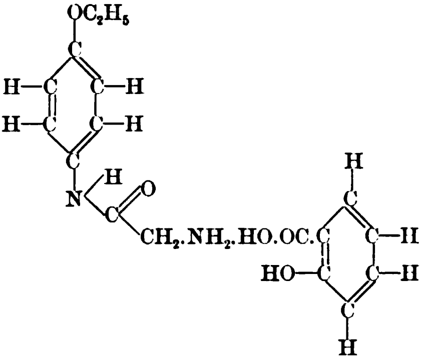


Manufacture: Chlor-acetyl chloride acts on para-amido-phenetol, and the resulting product is treated with ammonia. This is a result of many attempts to form a soluble phenacetin; it is a white crystalline powder, soluble in 20 parts water. When boiled with acids or alkalies it is broken up into phenacetin and glycocoll, and this latter base is always precipitated upon adding ammonia, alkalies or alkaline carbonates to any of its solutions. Dose, gr. 5–15 (.3–1 Gm.), in capsules.

Properties and Uses.—Antipyretic, anti-neuralgic, anti-rheumatic, diaphoretic; hectic fever, chronic and acute rheumatism, neuralgia, hypnotic.

Phenocoll Salicylate. Phenocollum Salicylicum.—Salocoll.

$C_6H_4(OC_2H_5)NHCOCH_2(NH_2)C_7H_6O_3 =$

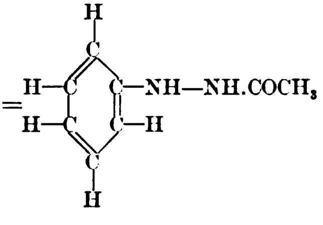


This is soluble in hot water, from which it crystallizes in fine needles; its aqueous solution is neutral in reaction and has a sweet taste. Dose, gr. 5–15 (.3–1 Gm.).

Properties and Uses.—Antipyretic, anti-rheumatic; combines those of phenocoll and salicylic acid.

Hydracetin. Pyrodin.—Acetyl-phenyl-hydrazine.

$C_6H_5NH—NHCOCH_3=$

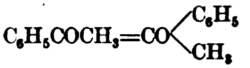


Manufacture: Heat together acetic anhydride, or acetic acid and phenyl-hydrazine, dissolve in boiling water, crystallize. It is in colorless, shining, odorless, tasteless crystals, soluble in alcohol, hot water; melts at 128° C. (263° F.); when boiled with HCl splits into acetic acid and phenyl-hydrazine hydrochloride. Dose, gr. $\frac{1}{6}$–1 (.01–.06 Gm.), ter die.

Properties and Uses.—Antipyretic, anti-neuralgic; hectic fever of phthisis, night-sweats. Externally, allied in effect to pyrogallol and chrysarobin in skin diseases, psoriasis. Apply in ointment 5–10 p. c., when stronger may poison the system by absorption.

VI. Aldehydes and Ketones.

Hypnone. **Acetophenone.**—Phenyl-methyl-ketone.

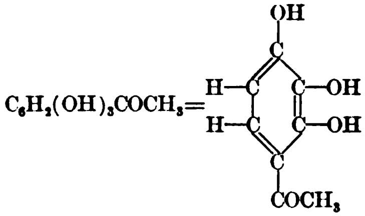


$$C_6H_5COCH_3=CO\begin{matrix}C_6H_5\\CH_3\end{matrix}$$

Manufacture: 1. Distil a mixture of calcium acetate and benzoate. 2. Act on benzene in the presence of $AlCl_3$ with acetyl chloride. It is in white crystals, melting at 20° C. (69° F.). When in liquid form it is slightly yellow, bitter-almond odor, bitter taste, hence objectionable to some. Dose, gr. or ♏v–15 (.3–1 Cc. or Gm.), which must be largely increased upon usage.

Properties and Uses.—Hypnotic, but somewhat uncertain.

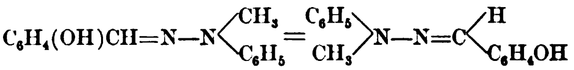
Gallacetophenone. **Tri-oxy-acetophenone.**—Alizarin Yellow.



Manufacture: Heat to 145–150° C. (293–302° F.) for a short time a mixture of 1 part pyrogallol and 1½ parts each of zinc chloride and glacial acetic acid, to this hot fused mass add water, and gallacetophenone will then separate out; this, now, can be purified by crystallizing from hot water. It occurs in dirty, flesh-color, powdery crystals, soluble in alcohol, ether, glycerin, hot water, or 600 parts cold water.

Properties and Uses.—Antiseptic; skin troubles, psoriasis, etc., in 10 p. c. solutions or ointments, being a good substitute for pyrogallol, as it does not stain or poison so easily.

Agathin. **Salicyl Aldehyde-methyl-phenyl-hydrazine.**



$$C_6H_4(OH)CH=N-N\begin{matrix}CH_3\\C_6H_5\end{matrix}=\begin{matrix}C_6H_5\\CH_3\end{matrix}N-N=C\begin{matrix}H\\C_6H_4OH\end{matrix}$$

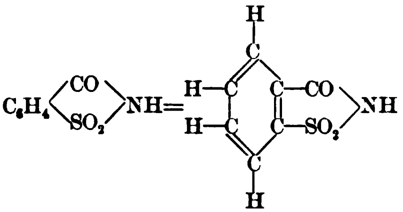
Manufacture: By the direct union of methyl-phenyl-hydrazine and salicyl aldehyde. It is in small greenish crystals, soluble in alcohol, benzene, ether, insoluble in water. Dose, gr. 5–10 (.3–.6 Gm.).

PROPERTIES AND USES.—Anti-neuralgic; neuralgia, rheumatism.

8. CARBOXYL DERIVATIVES (CO_2H).

Benzoic Acid. Acidum Benzoicum, $C_7H_6O_2$.—(*Official.*) See page 438.

Saccharin. Benzoic Sulphinide. — Anhydro-ortho-sulphamine Benzoic Acid.

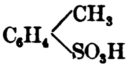


Manufacture: This is effected by six different steps:

1. $O_6H_5CH_3$

Toluene

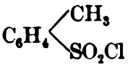
2\.



$C_6H_4\langle^{CH_3}_{SO_3H}$

Ortho-toluene-sulphonic Acid

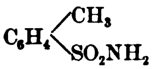
3\.



$C_6H_4\langle^{CH_3}_{SO_2Cl}$

Ortho-toluene-sulpho-chloride

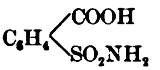
4\.



$C_6H_4\langle^{CH_3}_{SO_2NH_2}$

Ortho-toluene-sulphamide

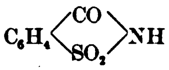
5\.



$C_6H_4\langle^{COOH}_{SO_2NH_2}$

Ortho-sulphamine-benzoic Acid

6\.



$C_6H_4\langle^{CO}_{SO_2}\rangle NH$

Saccharin

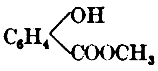
$1+H_2SO_4=2$;—$2+Na_2CO_3+PCl_5=3$;—3+ dry ammonia gas=4; —$4+KMnO_4+$an acid=5; —5 splits into its anhydride (saccharin) and water. It is a light crystalline powder, very sweet taste in dilute solutions, soluble in alcohol, ether, glycerin, alkalies, 400 parts water. It is 280 times sweeter than sugar. Dose, gr. 1–3 (.06–.2 Gm.).

PROPERTIES AND USES.—As a sweetening agent in diabetes, antiseptic.

9. OXYBENZOIC (SALICYLIC) DERIVATIVES.

Salicylic Acid. Acidum Salicylicum, $C_7H_6O_3$.—(*Official.*) See page 432.

Methyl Salicylas. Artificial Oil of Wintergreen,



$C_6H_4\langle^{OH}_{COOCH_3}$

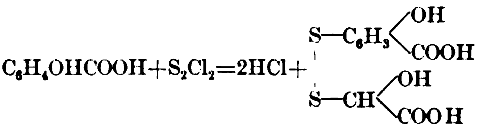
(*Official.*) See page 432.

Di-iodo-salicylic Acid, $C_6H_2I_2(OH)COOH$.

Manufacture: To an alcoholic solution of salicylic acid add iodine and iodic acid. Occurs as a crystalline powder, sweetish taste, melts at 220–230° C. (428–446° F.) with decomposition, soluble in alcohol, ether, 660 parts boiling water, 1,500 cold water. Dose, gr. 5–20 (.3–1.3 Gm.).

PROPERTIES AND USES.—Analgesic, antiseptic, antipyretic.

Sodium di-thio-salicylate.



$$C_6H_4OHCOOH + S_2Cl_2 = 2HCl + \begin{array}{l} S—C_6H_3\begin{array}{l}\diagup OH \\ \diagdown COOH\end{array} \\ | \\ S—CH\begin{array}{l}\diagup OH \\ \diagdown COOH\end{array}\end{array}$$

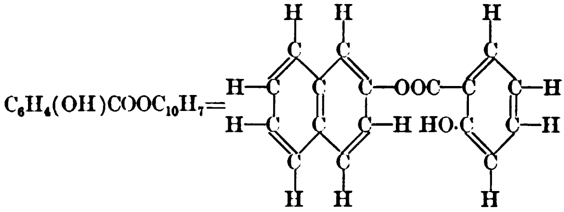
Manufacture: Heat together salicylic acid and sulphur chloride. It is a gray, hygroscopic, amorphous powder, soluble in water. Dose, gr. 5–15 (.3–1 Gm.).

PROPERTIES AND USES.—Antiseptic, antipyretic, analgesic.

Salol. **Salol,** $C_6H_5C_7H_5O_3$.—(*Official.*) See page 765.

Meta-Cresalol, $C_6H_4(OH)CO_2C_6H_4CH_3$, and **Para-Cresalol,** $C_6H_4(OH)CO_2C_6H_4CH_3$, are made by condensation of salicylic acid with either meta- or para-cresol. Both occur in colorless, odorless, tasteless crystals, and are used like salol. Dose of either, gr. 5–30 (.3–2 Gm.).

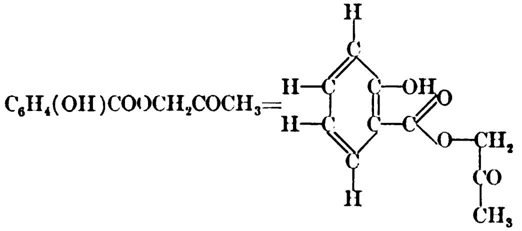
Betol. **Naphto-salol.**—Naphtyl Salicylate, Salinaphtol.



Manufacture: By replacing a hydrogen atom in salicylic acid by naphtol group ($C_{10}H_7$), instead of phenol group (C_6H_5) as in salol. Heat together beta-naphtol sodium, sodium salicylate and phosphorus oxychloride. It is a white, tasteless, inodorous, crystalline powder, soluble in boiling alcohol, ether, benzene, warm fixed oils, insoluble in water or glycerin. Dose, gr. 2–5 (.13–.3 Gm.).

PROPERTIES AND USES.—Intestinal antiseptic; articular rheumatism, vesical catarrh, cystitis; instead of salol.

Salacetol. **Acetol Salicylate.**

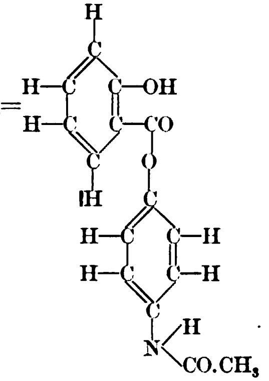


Manufacture: Differs from salol in replacing the phenol group (C_6H_5) by acetone radical ($CH_2—CO—CH_3$). Heat together sodium salicylate and mono-chlor-acetone — $C_6H_4(OH)COO[Na+Cl]CH_2$-$COCH_3 = NaCl + C_6H_4(OH)COOCH_2COCH_3$. It occurs in needle crystals, bitter taste, melts at 71° C. (160° F.), soluble in 15 parts alcohol, 25 castor oil, 30 olive oil, 2,200 water. Dose, gr. 15–30 (1–2 Gm.).

Properties and Uses.—Similar to salol; rheumatism, diarrhœa.

Salophen. Acetyl-para-amido-phenol-salicylate.

$C_6H_4(OH)CO_2C_6H_4NHCOCH_3=$

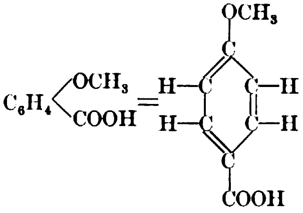


Manufacture: By a complicated process resembling somewhat that of salol—para-nitro-phenol-salicylate, ($C_6H_4(OH)COOC_6H_4NO_2$), is formed by condensation of salicylic acid and para-nitro-phenol; this upon reduction gives para-amido-phenol-salicylate ($C_6H_4(OH)COOC_6H_4NH_2$), and this acted on by acetic acid gives salophen. It is in white scales, odorless, tasteless, soluble in alcohol, ether, alkalies, insoluble in water, melts at 188° C. (370° F.); contains 51 p. c. salicylic acid. Dose, gr. 5–15 (.3–1 Gm.).

Properties and Uses.—Antiseptic, antipyretic. As a substitute for salol, or salicylic acid in acute articular rheumatism, also as an intestinal antiseptic. It is much safer and just as efficient as salol.

10. Para-oxybenzoic Derivatives.

Anisic Acid. Methyl-para-oxy-benzoic Acid.



$C_6H_4\begin{cases}OCH_3\\COOH\end{cases}=$

Manufacture: 1. By the oxidation of para-cresyl-methyl ether. 2. By heating methyl iodide with potassium para-oxy-benzoate. 3. By the oxidation of anethol. It is a light, colorless crystalline powder, soluble in alcohol, ether, slightly in water; melts at 184° C. (363° F.), boils at 277° C. (530° F.). Dose, gr. 2–5–10 (.13–.3–.6 Gm.).

PROPERTIES AND USES.—Antiseptic, anti-rheumatic, neuralgia, acts like salicylic acid; usually given as sodium anisate.

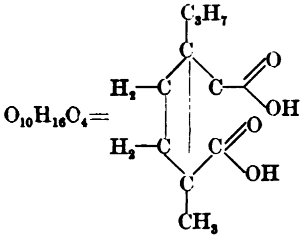
Orthoform. Methyl-para-amido-meta-oxybenzoate.

$C_6H_3OH(NH_2)C_2H_3O_2$.

This is a permanent, colorless, odorless, tasteless, crystalline powder, slightly soluble in water; the chloride quite soluble, but so acid as often to preclude its use. Dose, gr. 5–10 (.3–.6 Gm.).

PROPERTIES AND USES.—Local anæsthetic, analgesic, antiseptic. Has no action on sound mucous membranes or unbroken skin, but serves best as a dusting powder to painful abrasions, burns, ulcers, or to stomach cancers and ulcers. Anæsthesia begins as soon as from cocaine, and lasts much longer (many hours to several days) owing to it being dissolved and removed slowly, but it does not penetrate the tissues to the same extent, only anæsthetizing those nerve-ends with which it comes in direct contact. May apply 5 p. c. solution of the chloride in diluted alcohol, and 10–20 p. c. ointments.

Camphoric Acid. Acidum Camphoricum.



Manufacture: Oxidize camphor by hot nitric acid. It occurs in acicular crystals, odorless, acid taste, soluble in alcohol, ether, fixed oils, 10 parts boiling water, 200 cold water. Dose, gr. 5–30 (.3–2 Gm.); locally in 1–4 p. c. solutions.

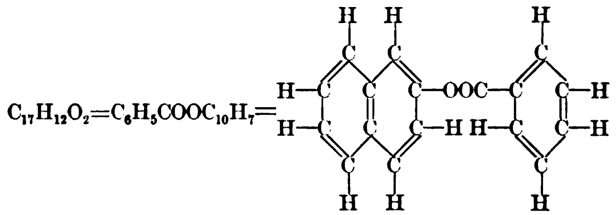
PROPERTIES AND USES.—Catarrhal affections, cystitis, night-sweats of phthisis, bronchitis, eczema, acne.

11. NAPHTALENE DERIVATIVES.

Naphtalinum. Naphtalin. Naphtalene, $C_{10}H_8$.—(*Official.*) See page 766.

Naphtol, Beta-naphtol, $C_{10}H_7OH$.—(*Official.*) See page 766.

Benzo-naphtol. Naphtyl Benzoate.—**Beta-naphtolum Benzoicum.**



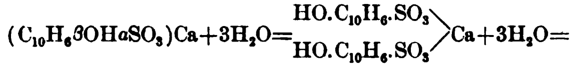
Manufacture: Act on beta-naphtol with benzoyl chloride. It is in colorless needles, soluble in alcohol, chloroform, slightly in water, melts at 110° C. (230° F.). Dose, gr. 4–8 (.26–.5 Gm.); may be applied in powder.

Properties and Uses.—Local and intestinal antiseptic.

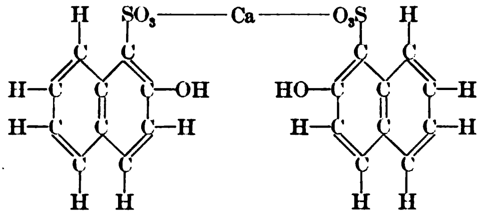
Di-iodo-beta-naphtol. Naphtol-aristol, $C_{10}H_5I_2OH$.—This compound is prepared like aristol, greenish-yellow, slightly soluble in alcohol, ether, acetic acid, very soluble in chloroform, insoluble in water.

Properties and Uses.—Antiseptic; locally like iodoform.

Asaprol. Calcium beta-naphtol-alpha-mono-sulphonate.



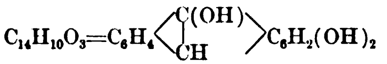
$$(C_{10}H_6\beta OH\alpha SO_3)Ca+3H_2O=\begin{matrix}HO.C_{10}H_6.SO_3\\HO.C_{10}H_6.SO_3\end{matrix}\!\!>Ca+3H_2O=$$



Manufacture: Neutralize the free acid, beta-naphtol-alpha-mono-sulphonate with calcium carbonate, concentrate the solution and crystallize. It occurs as a white powder, soluble in water or alcohol, neutral reaction, not altered by heat, non-irritant, toxic, does not affect digestion, and is eliminated by the kidneys. Dose, gr. 5–20 (.3–1.3 Gm.).

Properties and Uses.—Antiseptic, antipyretic, analgesic; influenza, typhoid fever, rheumatism.

Anthrarobin. Des-oxy-alizarin.—Dioxy-anthrol, Leuko-alizarin.



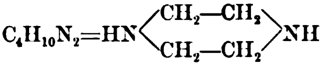
$$C_{14}H_{10}O_3=C_6H_4<\begin{matrix}C(OH)\\|\\CH\end{matrix}>C_6H_2(OH)_2$$

Manufacture: Act on alizarin with nascent hydrogen—$C_{14}H_8O_4+H_4=C_{14}H_{10}O_3+H_2O$. It occurs as a yellowish powder, soluble in caustic alkalies, glycerin or alcohol, insoluble in water or diluted acids.

Properties and Uses.—In skin diseases like chrysarobinum; ointment (10–20 p. c.).

VII. Organic Bases.

Piperazine. Piperazinum.—Di-ethylene-diamine, Ethylen-imine.



$$C_4H_{10}N_2=HN<\begin{matrix}CH_2—CH_2\\CH_2—CH_2\end{matrix}>NH$$

Manufacture: By the action of ammonia upon ethylene bromide or chloride—the mixture of bases formed is fractionally distilled, that between 130–180° C. (266–356° F.) being collected, which upon cooling separates piperazine. It is in colorless, acicular crystals, soluble in water, very hygroscopic; dissolves twelve times more uric acid than will lithium carbonate, and its urate compound is soluble in 50 parts water, lithium urate in 368. Dose, gr. 10–15 (.6–1 Gm.).

PROPERTIES AND USES.—Diuretic. Increases the urea but diminishes the uric acid in urine, gout, rheumatism.

Diaptherin. Oxy-quin-aseptol.—Oxychinaseptol.

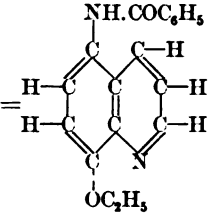
$$C_6H_4(SO_2)\begin{cases}O-NH.C_9H_6(OH)\\ O-NH.C_9H_6(OH)\end{cases}$$

Manufacture: This is made by uniting two molecules of ortho-oxyquinoline with one molecule of ortho-phenol-sulphonic acid. It is a bright-yellow powder of hexagonal prisms, soluble in water, diluted alcohol, non-caustic and non-toxic, owing to which it is better than carbolic acid.

PROPERTIES AND USES.—Antiseptic, wounds (in 1 p. c. solutions).

Analgen. Benzanalgen.—Ortho-ethoxy-ana-mono-benzoyl-amidoquinoline.

$C_{18}H_{16}N_2O_2{=}C_9H_5NOC_2H_5NHCOC_6H_5=$

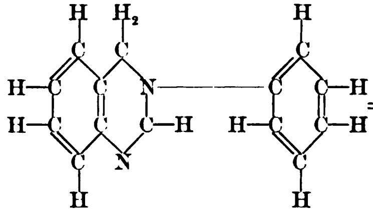


This is obtained, by a very complicated process, as a white, neutral, tasteless powder, soluble in hot alcohol or acids, slightly in cold alcohol, insoluble in water, melts at 208° C. (406° F.). Dose, gr. 10–15 (.6-1 Gm.).

PROPERTIES AND USES.—Antipyretic, anti-rheumatic; rheumatism, neuralgia, headache.

Orexine Hydrochloride. Phenyl-di-hydro-quinazoline Hydrochloride.

$C_6H_4.NCH.CH_2NC_6H_5HCl = C_{14}H_{12}N_2HCl + 2H_2O =$



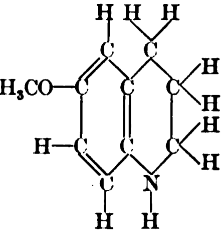
=Orexine base.

Manufacture: We start with formanilid, making sodium formanilid, then orthonitrobenzyl-formanilid, and finally orexine hydrochloride. It occurs as a white powder, or in acicular crystals, bitter, pungent taste, soluble in alcohol, 13 parts water, insoluble in ether, very irritating to the nostrils. The tannate causes no gastric irritation.

PROPERTIES AND USES.—Stomachic. Dose, gr. 4–8 (.26–.5 Gm.) in wafers, to be accompanied with a large draught of water.

Thalline. Tetra-hydro-para-quin-anisol.

$C_9H_{10}N(OCH_3)=$



Manufacture: Heat a mixture of para-amido-anisol, para-nitro-anisol, glycerin, sulphuric acid, then treat this with tin and hydrochloric acid. The free base at ordinary temperatures is an oily liquid, but on cooling gives yellowish-white crystals, soluble in alcohol, ether, benzene, sparingly in benzin or water, anise-like odor, nauseous, with oxidizing agents gives green color and forms salts with acids.

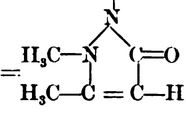
Thalline Sulphate. Thallinæ Sulphas, $2(C_{10}H_{13}NO)H_2SO_4$, or $2C_9H_{10}N(OCH_3)H_2SO_4 + 2H_2O$.—This is obtained by dissolving thalline in dilute sulphuric acid and crystallizing or granulating. This salt is that which is mostly used, often being designated simply as thalline. It occurs as a yellowish-white crystalline powder, anise-like odor, nauseous, bitter, saline, pungent taste, soluble in hot water, sparingly in chloroform or ether, 7 parts cold water, 100 alcohol; solutions darken with age and exposure to light; contains thalline 76.9 p. c. and sulphuric acid 23.1 p. c.

Thalline Tartrate, $C_{10}H_{13}NO,C_4H_6O_6$.—This is also a yellowish-white crystalline powder, resembling the sulphate in appearance and taste, but is much less soluble in water, requiring 10 parts; contains thalline 52.2 p. c. and tartaric acid 47.8 p. c.

PROPERTIES AND USES.—These are antipyretics, germicides, rarely used internally, being poisonous; good as injections for gonorrhœa in 1–2 p. c. solutions.

Antipyrine. Antipyrinum.

$C_6H_5(CH_3)_2C_3HN_2O$ or $C_{11}H_{12}N_2O=$



(Syn., Phenazonum, Phenazone, Methozine, Analgesine, Dimethyl-phenylpyrazolon phenazon. Dehydrodimethyl-phenyl-pyrazine, Sedatin; Fr. Anodynine, Parodyne; Ger. Antipyrin.)

Manufacture: Aniline chloride or sulphate is treated with sodium nitrite, the resulting diazobenzene chloride or sulphate is treated with reducing agents (alkali sulphite and stannous chloride), forming phenylhydrazine; this is acted on with di-acetic ether, forming phenyl-monomethyl-pyrazolon, alcohol, and water—$CH_3COCH_2COOC_2H_5 + H_2NN$-$HC_6H_5 = C_6H_5(CH_3)_2C_3H_2N_2O + C_2H_5OH + H_2O$. This monomethyl compound is treated with methyl iodide and methyl alcohol, when antipyrine iodide results—$C_6H_5(CH_3)_2C_3H_2N_2O + CH_5I = C_6H_5(CH_3)C_3H$-$N_2O + HS$, from which the former separates upon the addition of soda solution, as a heavy oil; now recrystallize from ether. It is in white crystalline scales, odorless, bitter, freely soluble in water, alcohol, chloroform. Dose, gr. 2–20 (.13–1.3 Gm.).

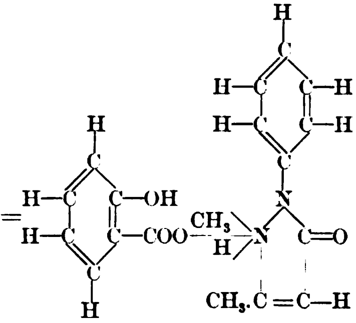
PROPERTIES AND USES.—Antiseptic, anodyne, antipyretic, cardiac depressant, hæmostatic, diuretic, anti-neuralgic, analgesic, contracts the blood-vessels, migraine, locomotor ataxia, rheumatism, neuritis, urticaria, chorea, gout (arthritis), whooping-cough, tetanus, epilepsy, spasmodic laryngitis, sciatica, labor pains, diabetes, gravel, dysmenorrhœa, headache, angina pectoris, cancer, syphilitic pains, biliary and renal colic, skin diseases, eye troubles, locally to ulcers and as a hæmostatic. This resembles acetanilid very closely, and, owing to its larger dose, must be handled with even more caution than it.

Poisoning: Have collapse, cyanosis, slow breathing, irregular pulse, vomiting, prostration, death. Treat as in acetanilid; give hypodermically alcohol, ether, strychnine, warmth to feet and body, etc.

Incompatibles: Iron chloride, iodide and sulphate, copper sulphate, iodine, arsenic iodide, carbolic acid, hydrocyanic acid, nitric acid, potassium permanganate, salicylates, corrosive sublimate, spirit nitrous ether. All tannin preparations give white precipitate, and chloral hydrate decomposes it.

Antipyrine Salicylate. Salipyrine.

$C_{11}H_{12}N_2O.C_7H_6O_3 =$



Manufacture: By the direct union of molecular proportions of antipyrine and salicylic acid, which is accomplished by heating together 57.7 p. c. of the former and 42.3 p. c. of the latter, dissolving in alcohol and crystallizing. It is a white crystalline powder, sweetish taste of salicylic acid, soluble in alcohol, chloroform, ether, 25 parts boiling water, 200 water, melts at 91° C. (196.7° F.). Dose, gr. 2–20 (.13–1.3 Gm.).

Properties and Uses.—Anti-rheumatic, anti-neuralgic; chronic articular rheumatism, sciatica.

Hypnal. Monochloral Antipyrine, $CCl_3,CH(OH)_2+C_{11}H_{12}N_2O$. *Manufacture:* About equal quantities or the molecular portions of antipyrine and chloral hydrate are each separately dissolved in water, then mixed together, and the underlying oily strata allowed to crystallize. It is in colorless crystals, nearly tasteless, non-irritating to mucous membranes, soluble in 15 parts water, melts at 67.5° C. (154° F.). Dose, gr. 2–20 (.13–1.3 Gm.).

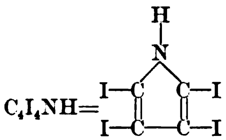
Properties and Uses.—Hypnotic, analgesic.

Iodopyrine. Iodantipyrine, $C_{11}H_{11}IN_2O$.

Manufacture: A hot solution of 1 part iodine in 12 parts alcohol is mixed with a solution of 1 part antipyrine in 4 parts alcohol. The mixture after several days will deposit crystals of iodopyrine. This is a substitute for antipyrine in which one hydrogen atom in the benzene nucleus is replaced by iodine. It is in colorless, silky, prismatic, tasteless needles, odorless, soluble in hot water, alcohol, slightly in cold water, melts at 160° C. (320° F.). Dose, gr. 2–20 (.13–1.3 Gm.).

Properties and Uses.—Causes fall of temperature, perspiration, without collapse or shivering. Has no advantage over antipyrine.

Iodol. Iodolum.—Tetra-iodo-pyrrol, Pyrrol Tetriodide.



Manufacture: Pyrrol, which is obtained from Dippel's oil (bone oil), is purified and acted upon with iodine in alcoholic solution for twenty-four hours, when water is added and iodol separates as a yellowish crystalline powder, bulky, odorless, tasteless, soluble in alcohol, ether, fats, 50 parts chloroform, 5,000 water, heated to 145° C. (293° F.) becomes decomposed; contains iodine 88.97 p. c. Dose, gr. ½–10 (.03–.6 Gm.).

Properties and Uses.—Antiseptic, stimulant, a substitute for iodoform externally and for potassium iodide internally; tertiary syphilis, scrofula, diabetes.

Cocaine. Methyl-benzoyl-ecgonin, $C_{17}H_{22}NO_4$.—Hydrochlorate (*official*). See page 320.

Alpha-Eucaine. Eucaine Hydrochlorate.—Eucaine Hydrochloras, N-methyl-benzoyl-tetra-methyl-y-oxypiperidin-carboxylic-methylester, $C_{19}H_{27}NO_4.HCl + H_2O$.

Beta-Eucaine. Eucaine Hydrochlorate.—Eucaine Hydrochloras, Benzoyl-vinyl-diaceton-alkamine, $C_{15}H_{21}NO_2.HCl$.

Manufacture: The former salt is obtained by treating thiacetonamine with hydrocyanic acid, then boiling with water to produce oxymethyl-piperidincarbonic acid; into this is now introduced the benzoyl and methyl groups, thereby forming the base eucaine. The latter salt is the benzoyl derivative of vinyl-diaceton alkalamine. Both occur as white, neutral, crystalline powders, soluble in cold water to the extent of forming 3–9 p. c. solutions, more soluble in hot water. For the eye use 1–2 p. c. solutions; for mucous surfaces 2–5 p. c.

Properties and Uses.—Both are local anæsthetics, intended to replace cocaine. The *alpha* was first introduced, but owing to its ocular irritation, and frequent toxic effects similar to cocaine, it has largely given away to the beta-eucaine. This latter salt has the advantage over cocaine in that it affects heart, circulation, and respiration much less, does not dry the corneal epithelium, nor cause mydriasis, or disturbed accommodation; solutions can be sterilized by boiling without decomposition and are permanent. It has, however, the disadvantage of causing hyperæmia rather than contraction of mucous membranes when locally applied.

Poisoning: Both salts are less poisonous than cocaine, but when taken internally produce similar effects, and excessive quantities must be combated by strong coffee, alcohol, digitalis, strychnine, ammonia, ether, nitro-glycerin.

Theobromine. Di-methyl Xanthine, $C_5H_2(CH_3)_2N_4O_2$.

Manufacture: From the seeds of *Theobroma Cacao* and from xanthine, which is a substance nearly related to uric acid. It is in colorless, bitter crystals, sparingly soluble in water, alcohol, or ether. See page 385.

Caffeine. Caffeina (Theine).—Tri-methyl Xanthine, $C_5H(CH_3)_3.N_4O_2 + H_2O$. (*Official.*) See page 519.

Theobromina Sodio-salicylas. Theobromine Sodio-salicylate. Diuretin.—Theobromio-natrium cum Natrio Salicylio, $C_7H_7N_4O_2Na + C_6H_4(OH)COONa$. See page 387.

Manufacture: Mix aqueous solutions of equal quantities (molecular proportions) of sodium theobromine and sodium salicylate and evaporate to dryness. It contains theobromine 49.7 p. c., salicylic acid 38.1 p. c., and corresponds to the most popular caffeine salt as used in Germany=Caffeine Sodio-salicylate. It is in white, odorless, amorphous powder, salty, alkaline taste, soluble in half-weight of warm water, which remains clear upon cooling. Dose, gr. 15–30 (1–2 Gm.).

Properties and Uses.—Diuretic. Has no heart action nor does it irritate the kidneys. Good in cardiac or hepatic dropsy.

PART VI.

THE MICROSCOPE AND ITS USE IN MATERIA MEDICA.

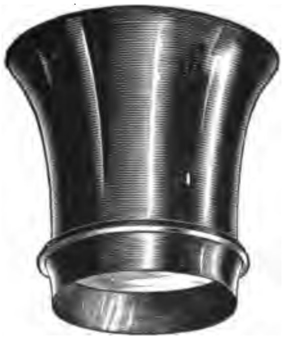
ALTHOUGH it is impossible for all druggists to become experienced with the microscope, yet every one can, by a little patience, study, and tact in its use, learn sufficient to have it serve him often to good advantage. One readily admits the importance of such knowledge when he observes that the skilful manipulator, in many cases, shares equal honors with the chemist in determining qualitative (sometimes quantitative) analysis of various substances—in fact a number of plant-constituents, as starches, oils, acids, sugars, crystals, alkaloids, etc., yield in the hands of chemists and microscopists similar and equally satisfactory results. While it is not the intention here to go very deeply into the subject, it is, however, desired to give that which the average pharmacist, if so disposed, can put with profit into practice. Special laboratory courses or various treatises pertinent to this department should be availed of for more extended information.

I. DESCRIPTION OF THE MICROSCOPE.

Of these there are two kinds—simple and compound.

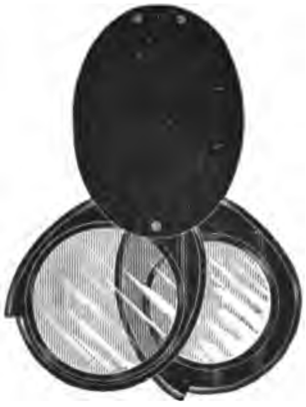
The Simple Microscope is only a hand magnifying-glass or linen-tester, and consists of a double convex lens (or several mounted in juxtaposition on a common axis), giving an extensive field of view and an erect

FIG. 441.



Simple microscope (watchmaker's).

FIG. 442.

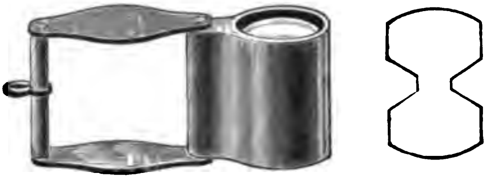


Simple microscope (magnifier).

image 5–30 times the size of the object. This instrument is valuable in field botanic work, crystallography, deciphering illegible prescriptions, recognizing various fabrics and other objects indistinctly visible by the naked eye.

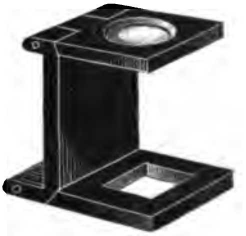
The Compound Microscope is a more complex instrument, and consists of several lenses so separated at focal distances that each one serves to magnify the image transmitted by the preceding one. The higher the magnifying powers used, the smaller becomes the area of the object that is seen through the instrument, and the light being correspondingly spread out over a larger area in the image, the latter appears less bright. The image is always inverted and magnified 10–4,000 times.

FIG. 443.



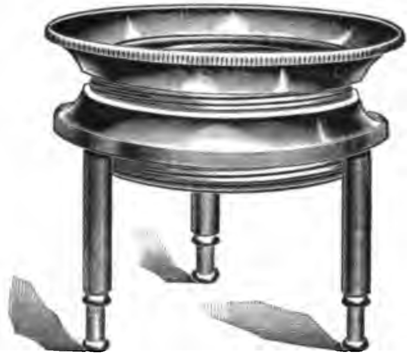
Simple microscope. (CODDINGTON.)

FIG. 444.



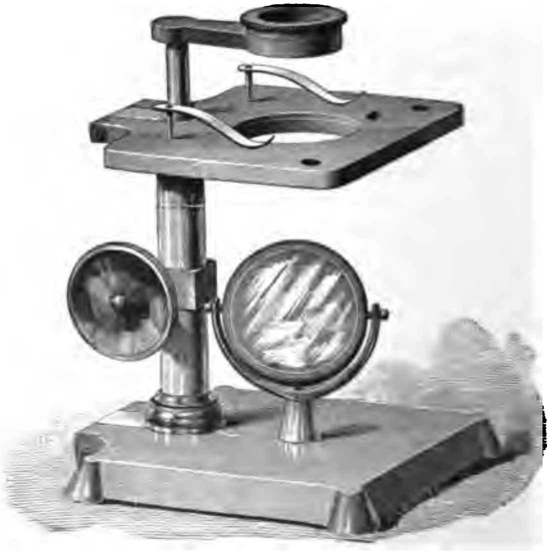
Simple microscope (linen tester).

FIG. 445.



Tripod dissecting microscope.

FIG. 446.

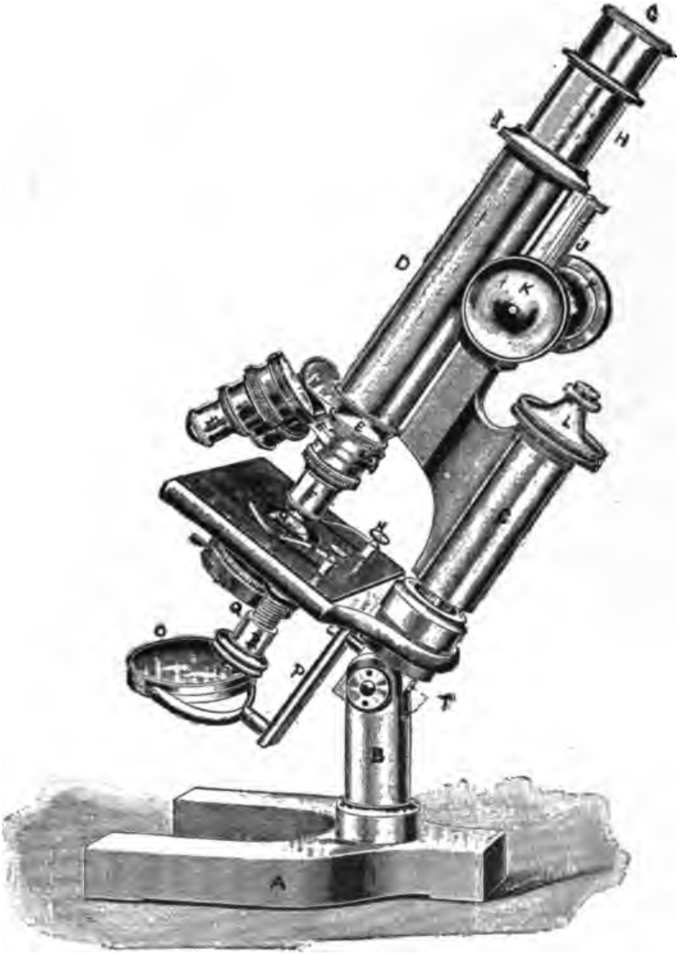


Folding dissecting microscope.

1. *The Ocular or Eye-piece* (G).—This, in the line of vision, is the part nearest to the eye, and has several types—Huyghenian, Conti-

nental, Kellner, Binocular, Solid (all negative), Ramsden, etc. (positive). The first named is mostly used, and consists of two plano-convex lenses (plane surfaces upward) mounted in a short metal tube; the one next to the eye—eye-lens; the one farthest—field-lens. Between these two a diaphragm is so placed as to cut off the blurred edges of the image, thus giving a flat field and a sharp, round outline to the field of vision. The ocular magnifies the real image produced by the objective as though that image were itself the original object; its magnifying power is inversely proportional to the length—the longer the tube the lower the power. Oculars are designated as fol-

FIG. 447.

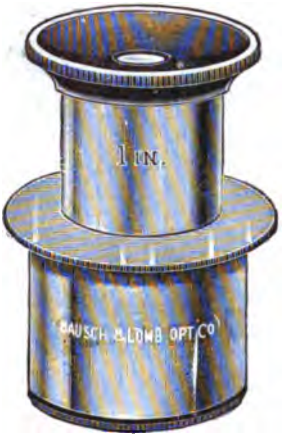


Compound microscope. A, base; B, Pillar; C, Pillar and arm; D, body; E, nose-piece; F, objective; G, ocular; H, drawtube; I, collar; J, rack and pinion; K, coarse adjustment; L, fine adjustment; N, spring clips; O, mirror; P, mirror bar; Q, diaphragm and substage; R, substage screw; T, pillar hinge-joint.

lows : A–2 inch, B–1½ inch, C–1 inch, D–¾ inch, E–½ inch—the first weakest, the last strongest.

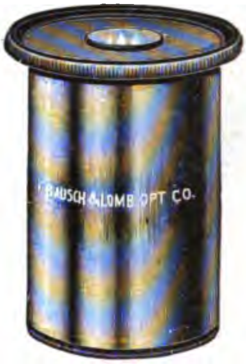
2. *The Objective* (F).—This, in the line of vision, is farthest removed from the eye and is the most essential portion of the instrument; to its many improvements (also further susceptibilities) are (and will be) due the great advancements in vegetable and animal histology. It consists usually of a front plano-convex lens (convexity upward), together with one, two, or three others, which may vary in shape between plano-convex, concavo-convex, and bi-convex (according to manufacture), working in combination as a single magnifier, thus producing an enlarged inverted and reversed image—this simple image being that which the ocular receives, and in turn magnifies. Objectives may be either *dry* or *immersion*, according as they are used without or with a drop of liquid between the lens and the object; if the liquid used has same refractive power as the glass lens, then it is

FIG. 448.



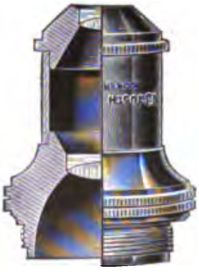
Ocular (HUYGHENIAN).

FIG. 449.



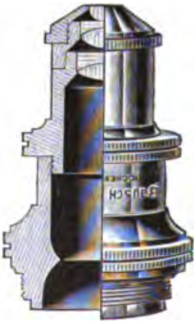
Ocular (Continental).

FIG. 450.



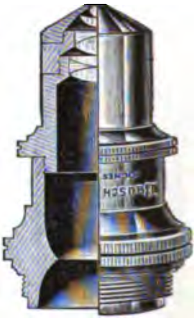
Objective, ⅔-inch.

FIG. 451.



Objective, ⅙-inch.

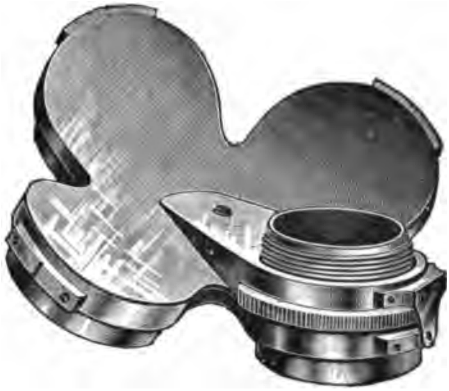
FIG. 452.



Oil-immersion objective, 1/12-inch.

called *homogeneous immersion.* Objectives are known by whole numbers and fractions, thus : 4—3—2—$1\frac{1}{2}$—1—$\frac{3}{4}$-inch = lower power ; $\frac{1}{4}$—$\frac{1}{5}$-inch = medium power ; $\frac{1}{6}$—$\frac{1}{8}$—$\frac{1}{10}$—$\frac{1}{12}$—$\frac{1}{16}$—$\frac{1}{20}$—$\frac{1}{25}$-inch = high power, all of which are but expressions for intrinsic focal distance ; a 1-inch objective, hence, has the same magnifying power as a simple lens with one-inch focus, etc. The strength is inversely as these figures—smaller the fraction the greater the magnifying power, also smaller the end lens the greater the power ; whereas working-distance, field of view, and amount of light are all directly as these figures—becoming less as the fraction diminishes. Objectives of low power, 2—1-inch, serve best for pharmacists, as these afford good working distance, hence the inspection of most objects without risk of the lower lens.

FIG. 453.



Objective nose-piece.

The following table shows approximate magnifying powers of oculars and objectives taken conjointly under the indicated combinations.

Oculars.	Objectives.												
	3 in.	2 in.	$1\frac{1}{2}$ in.	1 in.	$\frac{3}{4}$ in.	n.	$\frac{1}{4}$ in.	$\frac{1}{5}$ in.	$\frac{1}{6}$ in.	$\frac{1}{8}$ in.	$\frac{1}{10}$ in.	$\frac{1}{12}$ in.	$\frac{1}{16}$ in.
A—2 inch.	11	16	23	30	55	88	190	230	265	345	382	580	820
B—$1\frac{1}{2}$ "	16	22	33	41	74	120	260	315	340	460	525	810	1100
C—1 "	21	30	44	53	96	155	355	410	450	590	701	1060	1420
D—$\frac{1}{4}$ "	28	40	56	69	130	200	455	550	585	770	900	1400	1860
E—$\frac{1}{2}$ "	35	54	70	85	165	265	560	710	750	980	1110	1760	2350

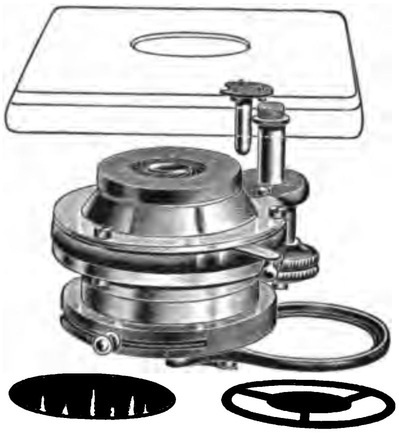
This compilation is based upon tube length being 160 Mm.—$6\frac{3}{10}$ inches ; for instruments whose tube length is 216 Mm.—$8\frac{1}{2}$ inches—an increase of about 25 p. c. must be added in each case.

Several higher objectives are made—$\frac{1}{40}$—$\frac{1}{50}$—$\frac{1}{80}$-inch, which magnify 2,000–5,000 diameters according to ocular used. These all contain, in addition to the 2–4 lenses for magnifying, a combination of lenses for correcting chromatic and spherical aberrations, the most of which is, however, compensated for by the opposite aberration of the ocular.

Chromatic Aberration.—The lens proper is not only a magnifier, but also a prism ; owing to this latter fact a ray of light in passing through it is bent out of its course and resolved into its elementary colors, thus giving, unless rectified, colored marginal bands around the image of the objects examined. This chromatic defect is satisfactorily overcome by a combination of lenses having opposite aberrations, namely, a convex crown lens and a concave flint lens, acting together as a single convex lens.

Spherical Aberration.—The convex lens, being in the nature of a prism, refracts rays of light towards the axis of the lens, but as the angle of the lens is greatest at the edge and gradually diminishes towards the centre where the faces are parallel, the rays of light going through the edge of the lens are refracted more and come to a focus nearer the centre of the lens; hence there is a want of focus of the rays, or spherical aberration. This defect interferes with the defining power; *i. e.*, the definition of the image—the image of a flat object becoming curved and blurred around its edges, so that in examining netted fabrics the central fibres are straight and distinct, the outer curved and indistinct. This spherical defect may be corrected by a diaphragm which cuts off border light by contracting the central aperture.

Fig. 454.



Screw substage.

3. *The Body* (D).—This consists of the two long telescoping tubes, the outer—the sleeve; the inner—the draw tube. To the upper end of this is attached the ocular, to the lower end the objective.

4. *The Stand* (A, B, C, etc.).—This is all the remaining portion of the instrument, but its various parts have received distinctive names, thus: A, Base or foot—variously shaped, triangular, horseshoe or circular, should be heavy so as to guarantee steadiness; B, Pillar—portion above and below the stage, often jointed; C, Arm; E, Nose-piece—double, triple or quadruple, into which several objectives are screwed, so that by turning either can be brought into visual position; K, Coarse adjustment; L, Fine adjustment, both worked by a milled screw; M, Stage; N, Spring clips; O, Mirror—with concave and plane surfaces, the former being mostly used; Q, Diaphragm; R, Substage; V, Abbé condenser—gives more light to objective, being of special service when examining stained specimens, which are recognized chiefly by color and not by outline.

II. Requisites of a Good Microscope.

Almost any make of high grade instrument will give satisfaction that has the following qualities:

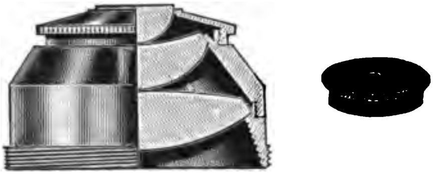
1. It should possess firmness and solidity through its base, pillar, arm, etc.

2. It should have a good-sized stage, preferably square, thick, firm, of glass, metal or vulcanite.

3. It should have coarse and fine adjustments, worked by rack and pinion; both must move evenly, smoothly, promptly, without wobbling.

4. It must possess working distance, thus the higher objective when in focus should leave sufficient space above the stage for the introduction of slides, etc., without danger of contact. The longer the working distance, the less will the distinctness of the image formed be affected by any given alteration in its focal adjustment. Lenses with greatest working distance have most focal depth.

FIG. 455.

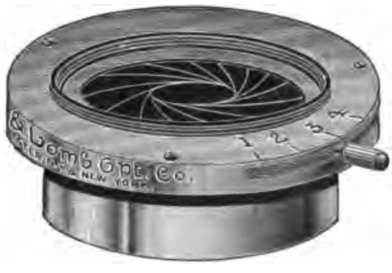


Abbé condenser.

5. A nose-piece is essential in order to economize time and facilitate work. This may be either double, triple or quadruple, and is an appliance fitting the tube's extremity for carrying two, three or four objectives, of varying power, any one of which may be quickly brought into direct position by turning the arm on a pivot.

6. The penetrating power (focal depth or range of focus) should be considerable. This quality, though not necessary for very thin sections, enables one to see the parts of an object not exactly in focus with sufficient distinctness to allow their relations with what lies exactly in that plane to be clearly traced out. Thus one lens may only for an instant give a sharp focus at a limited distance from the object, while another lens may give a good image at a considerable distance above and below the best focal point; the former prevents us from ascertaining the relation of the higher layers of an object to the lower unless we continually follow the focus with the fine adjustment; the latter lens, having greater penetration, brings a thicker portion of the object into view at the same time—the greater the penetrating power the better the microscope.

FIG. 456.



Iris diaphragm.

7. Flatness of the field varies with the magnifying power and angle of aperture of the lens. Here all parts of the field are in focus at the same time, so that the image is distinct over the whole field at once without any marginal color. This should be tested under an eyepiece giving a large aperture.

8. The distinctness of the image (defining power) must be good; this depends upon the complete correction of chromatic and spherical

aberrations and upon the accurate centering of the lenses, otherwise the outer borders will be blurred.

9. Resolving power, by which very minute and closely approximated markings, lines, striæ, dots, and apertures can be separately discerned; the maximum capacity thus far attained being the separation of 118,000 lines per linear inch. These last three qualities are very essential.

III. Directions for Using the Microscope.

1. For working select a northern window; this insures the greatest amount of reflected light possible from white clouds. Never use direct sunlight, and if possible avoid artificial light. If southern exposure is alone available, have window-blind, and that well drawn.

2. The instrument should be placed between the operator and the window, and, all working parts being in order, the mirror and lens to be used should be wiped with soft chamois leather.

3. The body of the microscope should be about vertical so as not to interfere with mounting in fluid media; the mirror should be adjusted to reflect light through the instrument, using plane side for parallel rays and concave for divergent rays.

4. Having inserted objectives into the nose-piece, place object for examination in the centre of the slide under cover-glass, and this as near the middle of stage as possible; adjust light by mirror and diaphragm, and focus with coarse adjustment.

5. Make all first examinations with low power and large diaphragm aperture, at least the one yielding distinct vision; then follow with higher powers and smaller apertures. The power should always be increased at the objective first, observing the following combination:

Ocular.	Objective.
2 inch	⅔ inch = low power.
2 "	⅕ " = medium power.
1½ "	⅛ " = high power.

6. Hold and adjust slides with thumb and forefinger of left hand, manipulate coarse and fine adjustments with right hand.

7. To focus, turn the objective down toward slide by means of coarse adjustment, short of contact; then with eye over the ocular focus backward until object is in view; from this point the exact focus can be made by one turn of the fine adjustment. With high powers focus in the same way, never allowing lower end lens of objective to have contact with cover-glass or any liquid, as such carelessness usually results in injury to object and objective. When properly focused, work fine adjustment slightly forward and backward during observations to get a series of optical sections of the object, also move slide on stage to bring in view different parts.

8. Never lift slides from stage, but gently slide them off without upward movement. Previous to doing this the tube should be raised out of focus, especially with high powers.

9. Accustom yourself to use both eyes indifferently, and when one

is in use keep the other open—never closed; this can soon be acquired with a little practice.

10. In examining powdered specimens a very small amount is placed upon a slide centrally, a drop of water or glycerin added with a pipette; now put over this with forceps (slantingly to avoid air-bubbles) a cover-glass, using slight pressure on it after it is in proper position, and absorb superfluous fluid with camel's-hair pencil or blotting-paper.

11. If specimen be tissues of which cross-sections must be taken, use for this purpose a razor or microtome (the latter only in experienced hands). The razor should have lower surface flat, upper slightly hollow-ground, must be sharp, opened in straight line with handle, and sections made by pulling from heel to toe, using in the sliding cut considerable edge length. Both razor and object should be wet while cutting, to prevent adhesion and admission of air; if material is fresh, use for it water or diluted alcohol; if material has been hardened, employ same strength alcohol as used in that process.

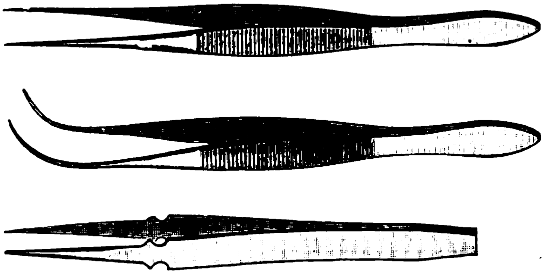
12. Hold objects between forefinger and thumb, allowing the razor to rest upon the former, when the sliding cut can be made. Sections must be cut as thin as possible so as to include but one layer of cells, which can only be acquired after considerable practice. Remove these with a camel's-hair pencil to a watch-glass containing water, and as desired arrange a section on slide under cover-glass with a drop of water, when it is ready for examination and the introduction of various reagents. If object be too small for such handling, it should be imbedded in some relatively hard substance—dried elder pith, cork, paraffin, etc., and then cross-sections taken as before, but through the combined mass.

IV. Accessory Apparatus and Reagents.

1. A pair of fine-pointed forceps for handling cover- and watch-glasses, small objects, etc.

2. A pair of fine scissors, shary-pointed and bent, for dividing tissues, etc.

Fig. 457.



Dissecting-forceps.

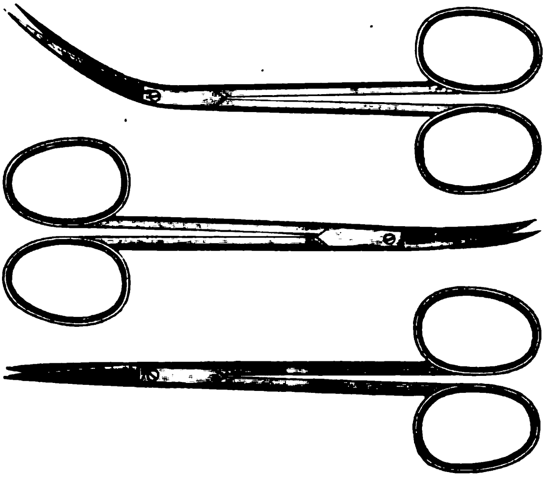
3. A pair of dissecting-needles for teasing tissues apart, etc.

4. A good razor, under side flat, upper slightly concave, edge straight, also strop and hone.

5. A supply of glass slides 3 x 1 inch, with ground edges, also cover-glasses, square or circular, ¾–⅞ inch, section lifters, etc.

6. Watch-glasses (flat bottom) in which sections are to be bleached, stained, etc.

Fig. 458.



Dissecting-scissors.

7. Graduated ruler for drawing and estimating magnifying power.

8. Camera lucida for drawing, the Abbé being the best.

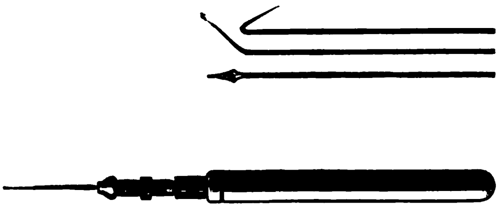
9. Spirit lamp, racks for holding slides and reagent bottles.

10. Pipettes, glass rods, camel's-hair pencils, blotting paper, chamois.

11. Micrometer adapted either to the eye-piece or stage, or to both.

12. Turn-table with self-centering device, for mounting and finishing slides.

Fig. 459.



Dissecting-needles.

13. Caustic potash—2–5–10 p. c. solutions, used to dissolve proteids, starch, to swell cell-walls, etc.

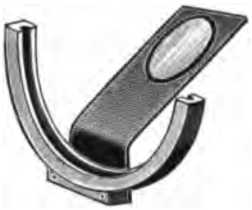
14. Acetic acid (glacial), 1–2 p. c. solutions, for defining nucleus, clearing cell-contents, in staining, and to distinguish calcium oxalate from calcium carbonate—the latter dissolving with effervescence.

15. Sulphuric acid, 92 p. c.—dissolves starch and cellulose, converting them into dextrin and amyloid respectively; diluted acid (10

p. c.)—serves to identify crystals in cells. Thus calcium oxalate, carbonate, phosphate, and malate are all converted into needles of calcium sulphate, while sphere crystals of inulin, resembling calcium phosphate, are completely dissolved.

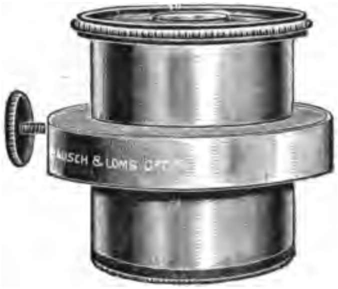
16. Hydrochloric acid—as a clearing agent, with phenol, thymol, aniline chloride, etc.; also to distinguish calcium oxalate from carbonate (dissolves latter with effervescence, the former slowly without effervescence); also to modify overstained sections from hæmatoxylin, carmine, and aniline solutions.

FIG. 460.



Camera lucida (brass mounted).

FIG. 461.



Ocular micrometer.

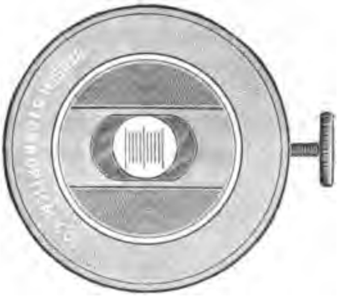
17. Nitric acid, 68 p. c.—causes protoplasm to shrink from cell-wall, and when ammonia is afterward added we have the middle lamella stained yellow; a 30 p. c. solution swells and finally dissolves amyloid.

18. Chromic acid (strong solution)—separates cells of thick-walled tissue, dissolving easily the middle lamella, finally the entire cell; a $\frac{1}{2}$–1 p. c. solution fixes cell-contents of tissues by soaking in it twenty-four hours, then wash and stain.

19. Compound iodine solution (tincture iodine + potassium iodide) stains starch blue, proteids yellowish brown, lignified cell-walls deep-brown, kills protoplasm without dissolving it, is a fixing agent, and with H_2SO_4 becomes a test for cellulose.

20. Chlor-zinc-iodine (Schulze's solution)—colors cellulose blue, lignified and cutinized tissues brown, starch is turned blue, swells and dissolves; swells cell-walls and stains protoplasmic threads brown, therefore is used in studying continuity of protoplasm from cell to cell.

FIG. 462.



Sectional view of ocular micrometer.

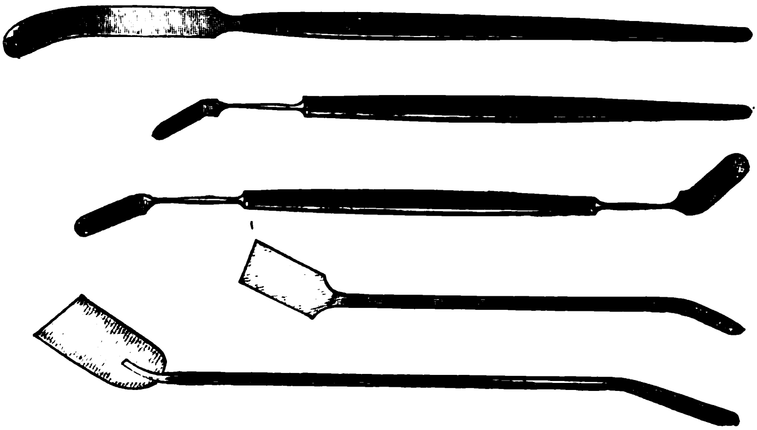
21. Aniline chloride, colorless, 5 p. c. alcoholic solution, or saturated aqueous solution + enough HCl to acidify—stains lignified tissues deep-yellow, but does not affect cellulose and cutinized tissues.

22. Fehling's solution—with grape sugar a red color is obtained. If cane sugar be present, a bluish or greenish color appears.

23. Ammonio-ferric-alum—with tissues containing tannin gives bluish-black or greenish-black precipitate.

24. Silver nitrate, 2–3 p. c. solution—develops the laminæ in starch grains and in thick-walled cells.

FIG. 463.



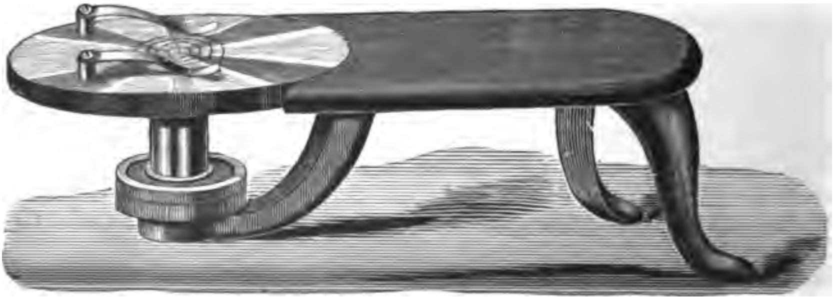
Section lifters.

25. Diphenylamine solution—turns tissues blue that contain nitrates.

26. Sulphuric ether—dissolves out oils, resins, fats, etc.

27. Alcohol—preserves tissue, dissolves chlorophyll, coloring-agents, resins, oils; also bleaches.

FIG. 464.



Turn-table.

28. Carbolic acid—useful clearing agent, can mount directly from this solution.

29. Glycerin—for clearing sections, preserving tissues for temporary or permanent mounting.

30. Canada balsam—for permanent mounting.

V. SOME ADVANCED MICROSCOPIC METHODS AND APPLIANCES.

1. *Estimation of magnifying power.*—While the table given on page 811 is of interest and service, yet, owing to slight variations therefrom of almost every microscope, each operator always prefers to test his own by one or all of the following methods:

(*a*) By taking absolute measurements. Ten inches is generally recognized as the normal length of distinct vision with the naked eye. Now suppose the distance from an object in focus to the upper end of ocular is ten inches, and that the two-inch ocular and one-inch objective are in service, we will then have the ocular focusing at two inches what the eye does in ten, or it magnifies five diameters—$10 \div 2 = 5$; also the objective focusing at one inch what the eye does in ten, or it magnifies ten diameters—$10 \div 1 = 10$, consequently these two combined—$5 \times 10 = 50$, which is the total magnification of the instrument as arranged. If we use one-inch ocular and $\frac{1}{5}$ objective, we have $10 \div 1 = 10$ = magnification of ocular alone; $10 \div \frac{1}{5} = 50$ = magnification of objective alone; hence the two combined—$10 \times 50 = 500$ diameters = combined magnification.

(*b*) By a stage micrometer and a two-inch boxwood rule. This micrometer is but a glass slide having 1,000 ruled lines to the inch. When this is focused and the rule placed in front of and parallel with it on the stage, we can compare the two simultaneously by looking at the micrometer through the microscope with one eye and at the ruler with the naked eye. If the micrometer spaces now appear half an inch apart, the magnifying power is 500 diameters; if one inch apart, then 1,000 diameters.

(*c*) By stage micrometer and camera lucida. This gives greater accuracy and is accomplished by focusing stage micrometer and placing a camera lucida on the eye-piece. To one side in same plane as stage place a sheet of white paper at right angles to the object viewed, and upon this will be projected the image of the lines, which then can easily be drawn and the distance between any two measured. Suppose they are $\frac{1}{5}$ inch apart; now those on micrometer are $\frac{1}{1000}$ inch apart, hence magnifying power is 200 diameters—$\frac{1}{5} \div \frac{1}{1000} = \frac{1000}{5} = 200$. Instead of the camera lucida an eye-piece micrometer in conjunction with the stage micrometer can also be used with equal if not better results.

2. *Hardening.*—If tissues to be examined are not sufficiently firm to allow satisfactory cutting—as tender parenchyma of non-vascular plants, they should be hardened by soaking several hours in diluted alcohol, then in pure alcohol. The employment of several alcohols varying in strength prevents tissue-contraction by osmotic action. Alcohol here dissolves resins, volatile oils, chlorophyll, thus acting as a bleaching agent. It coagulates and kills protoplasm without impairing its structure, also renders it more opaque when it can be readily stained with the various fluids; it also dehydrates tissues previous to being mounted in Canada balsam.

3. *Softening.*—All dry and hard substances must be softened before sections can be properly made. In the case of roots, rhizomes, tubers, corms, fruits, seeds, etc., they are first soaked in alcohol half an hour to expel air, then in water several hours or until saturated (hard tissues, shells, etc., may require several days); if now too soft for cutting, lay in alcohol twenty-four hours; if again too hard or brittle, place in a mixture of equal parts of alcohol and glycerin for twenty-four hours. In such roots as gentian, etc., that are much shrunken, we should use for water in second stage a 1–2 p. c. aqueous solution of caustic potash or ammonia; this alkali, however, must always be washed out with water before hardening. Specimens thus prepared can be kept always in readiness by letting them remain immersed in a mixture of equal quantity of alcohol and glycerin.

4. *Clearing.*—It is often necessary to clarify sections by having absorbed from them such substances as would prevent transparency—starch, resins, oils, etc. To accomplish this sections must be boiled in water and put into diluted Labarraque's solution for 15 minutes, or placed for a short while into a mixture of 4 parts oil of turpentine + 1 of creosote, or into pure oil of cloves, then mounted in Canada balsam. When sections have been stained must first soak them in alcohol for a few minutes and then in the clearing-mixture.

5. *Staining Fluids.*—These make prominent and differentiate thin cell-walls, inconspicuous and uniform tissues, etc., thus making their differences in appearance very perceptible.

(*a*) Hæmatoxylin. Prepared by mixing 2 parts saturated alcoholic solution hæmatoxylin with 75 parts saturated aqueous solution ammonia alum; let stand a week in sunlight, filter, and to every 7 parts add 1 part each glycerin and methyl alcohol, allow sediment to deposit by standing, filter. Used to stain lignified and cellulose walls—not cutinized ones; is also a good nuclear stain. Sections must soak several hours—those from alcohol should first be washed and all acids avoided.

(*b*) Fuchsin. A solution of fuchsin in water, used to stain lignified cell-walls, as these hold color better than non-lignified ones. When sections with fuchsin staining are washed with a mixture of saturated solution of picric acid 1 part + water 2 parts, the fuchsin is removed from unlignified cell-walls while lignified ones remain beautifully stained. These may now be dehydrated and mounted, or double-stained with aniline blue, then dehydrated and mounted.

(*c*) Methyl-green. An aqueous solution of methyl-green sufficiently strong to give deep-green color. It stains protoplasm, nucleus, also lignified and cutinized tissues better than it does cellulose. Tissues absorb color quicker if previously washed in weak acidified (HNO_3) water.

(*d*) Iodine-green. Made by dissolving iodine-green in water until we get a deep-green solution. This stains lignified and cutinized tissues green, also proteids, amyloplasts attached to young starch grains; acts on cellulose tissues slightly. Often used with carmine, eosin, or fuchsin for double staining.

6. *Mounting.*—When for only temporary or immediate use water or glycerin, or a mixture of the two, is employed. If it is to be permanent, then Canada balsam is the best medium. This is accomplished thus : The sections, if stained in aqueous solution, must first be dehydrated by placing for a few minutes in 70 p. c. alcohol, then in 90 p. c., and finally in 98 p. c.; now put for a short while in clearing medium—oil of cloves, or oil of turpentine—place a section on centre of slide, add to it a drop of balsam, apply cover-glass slantingly to avoid air-bubbles, slightly tapping same to a fixed position. If just sufficient balsam is used, we have simply to let it dry several days, then ring with a circle of colored cement around marginal contact of cover-glass with slide.

VI. THE MICROSCOPE IN THE DRUG-STORE.

While it is true that many official drugs come to us with adulterations and sophistications, yet in order to identify such with the microscope one must be perfectly familiar with the true appearance of the pure drug. He must, in order to be certain of reliable results, examine, at least, a dozen samples taken from various portions of the substance in question. In examining cross-sections of drugs in their original entire form we must know the arrangement as well as character of all the composing tissues, by which alone identification and recognition can be assured. In examining powders we have the most difficulty, as quite all the original characteristics are much changed or destroyed by comminution. Here, however, a sample of the crude article as powdered by one's self is to be compared with that specimen under consideration. Should the direct observance of a powder through the various objectives give little satisfaction, then micro-chemical reagents can, in regular sequence, be added with, as a rule, good results. With the simple examination of the microscope we can readily recognize the border pits, so characteristic of gymnospermous plants (savine, etc.), when mixed with angiospermous powders. Again a powder may contain, as a natural constituent, the very thing with which it is mostly adulterated (starch in black pepper, etc.); in all such cases the abnormal quantity present will show conclusively any fraudulent addition; again, resins, oil globules, crystals, starch, etc., may be observed as present and yet not a true constituent; such would excite suspicion and lead to further application of specific tests; again, the kind of delicate hairs as characteristic of certain plants can often be recognized whole or in part—unicellular or multicellular; the thickness and appearance of varying cell-walls; the individual variety of tissue, etc., will also often aid in the identification. The elementary components and contents of plant tissues to be looked for are fragments of ducts, bast-cells, characteristic epidermal and stone-cells, cork, plant hairs, glands, calcium oxalate crystals, starch, etc. The adulterations that are known to likely occur in respective drugs should be studied separately themselves, so that when encountered where not belonging they can be easily identified. Such adulterants may consist of mineral matter, as calcium sulphate, calcium carbonate, iron carbonate, iron oxide, clay, brick, sand, sawdust, starch, flour, resin, wood, bark, seeds, beans, peas, leather, cocoanut shells, exhausted and injured drugs, etc.

The following samples are but a few of the very many which any druggist can experiment with to his satisfaction and advantage.

I. **Roots.** 1. *Senega from False Senega.*—Soak suspected root in water until soft (ten hours), make thin cross-sections; true has irregular, porous, yellowish wood; false has cylindrical, porous, whitish wood. The irregularity of the structure of the cortex of senega (true) is well brought out by staining with hæmatoxylin solution. See pages 346–348.

2. *Taraxacum from Chicory.*—Make thin cross-sections as before; taraxacum shows in the bark laticiferous ducts in many brown circles; chicory has these vessels arranged radially. The location of the laticiferous ducts is readily revealed by staining with hæmatoxylin, as they assume a darker color than the other cells on account of the dense coagulated contents of the duct. Both have deposits of inulin (which is closely related to starch) in the soft cells, which stains yellow with iodine. See pages 555–557.

3. *Calumba from Bryonia.*—The former shows thick bark, small wood-bundles bright-yellow, distant near the centre, in narrow rays near the bark, medullary rays broad, parenchyma filled with starch; bryonia has thin bark, cork thin, friable, wood-bundles small, numerous, in rays and concentric circles, surrounded by thin-walled parenchyma. See pages 209, 551.

4. *Belladonna from Inula.*—The former has thickish bark, no bast-fibres, wood-bundles central, small, distinct, surrounded in the thicker roots by broader wood-wedges, and equally wide medullary rays; inula has a broad bark of small cells, radially arranged, with a distinct light circle of cambium between the bark and the wood area, which latter is made up of a large proportion of soft cells radially arranged and many large wood-vessels in rows. Both in the bark and the wood area there are many large openings of resin-ducts. Inula contains inulin deposited as spheres in the cells, while belladonna has much starch over the whole section. See pages 564–594.

5. *Ipecac from Spurious Ipecacs.*—Ipecac has quite a regular bark of isodiametric cells containing starch; some of the cells contain oxalate raphides (needles), particularly in inner bark. The wood is radiate, with medullary rays hardly distinguishable from the wood-cells in shape, but containing starch grains. False roots have thick bark, no starch. See pages 520–525.

6. *Pareira from False Pareiras.*—The former has thin bark, wood in several concentric circles, waxy cut, wood-wedges porous, uniform, numerous, separated by wavy circles of waxy parenchyma-tissue resembling medullary rays, stem with central pith. False roots have hard wood in eccentric circles, fresh cut not waxy. See pages 207, 208.

II. Rhizomes. 1. *Veratrum Viride from Cypripedium.*—The former has one-seventh diameter in cortex consisting of parenchyma having starch, sometimes calcium oxalate, few wood-bundles, one-eighth inch from outside has brownish wavy nucleus-sheath, centre with many wood-bundles; cypripedium has thick cortex, indistinct nucleus-sheath, wood-bundles approximate, more distinct centrally, parenchyma has starch. See pages 92, 129.

2. *Arnica from Strawberry.*—The former has thick bark, thin cork, circle of resin-cells, wood-wedges in a close circle enclosing large pith; strawberry rhizome has no resin-cells, but starch. See pages 578, 579.

3. *Serpentaria from Spigelia.*—The former has thin bark containing some oil-cells, wood-wedges longest on under side, separated by broad medullary rays, pith large-celled; spigelia has thin bark, divided into two distinct layers, an inner third and outer two-thirds; wood circle thickest on under side, radiate, continuous except usually at one end where wood is missing, medullary rays hardly visible. Pith oval and sometimes decayed; resin spots in wood, especially around pith. See pages 166, 446.

4. *Hydrastis from Caulophyllum.*—The former has thick bark, broad wood-wedges, not fixed in number (often 10), decidedly yellow; medullary rays broad, yellow, pith large, both, like the bark, contain starch; caulophyllum has thin bark, wood-wedges not as long as in hydrastis, medullary rays broad, pith large, parenchyma contains starch. See pages 185, 199.

5. *Helleborus Niger from Helleborus Viridis.*—The former has bark thick, circle of 8 wood-wedges, broad medullary rays, pith large; helleborus viridis has circle of 4 wood-wedges, broad medullary rays. See page 189.

III. Woods. 1. *Guaiacum from Santalum Album.*—The former consists mostly of wavy interwoven wood-fibres, numerous one-rowed medullary rays, large single ducts and narrow lines of wood, parenchyma in 1–2 rows of irregular and interrupted circles—all cells contain resin; santalum album has ducts single, moderate size, wood-parenchyma narrow, contains volatile oil or calcium oxalate, medullary rays narrow, in 1–2 rows. See pages 164, 322.

2. *Santalum Rubrum from Hæmatoxylon.*—The former has large ducts, one-rowed medullary rays, wood-parenchyma four-rowed in interrupted, irregular circles, cells with red resinous coloring matter, parenchyma with calcium oxalate crystals; hæmatoxylon has large ducts, often in groups of two, medullary rays two-rowed, wood-parenchyma in broad, wavy, circular lines, coloring matter in wood-fibres and ducts. See pages 282, 298.

IV. Barks. 1. *Cinchona Calisaya from Cinchona Succirubra.*—The former has very few, if any stone- (resin-) cells, old bark with prominent secondary cork, medullary rays narrow, bast-fibres single, sometimes in groups of two, rarely more, medium sized; cinchona succirubra has no stone-cells, medullary rays narrow, bast-fibres medium, in lines two to five, seldom eight. See pages 527, 528.

2. *Quillaja from Ulmus.*—The former has crystals of calcium oxalate on the cross-section or on the broken splintery fracture, also starch grains; slippery elm has fracture fibrous mealy, very little starch, but no calcium oxalate. See pages 156, 554.

V. **Fruits.** 1. *Anise from Conium.*—The former has flat face, 5 light-brown filiform ridges, also 15 or more thin oil-tubes; conium has 5 crenate ribs but no oil-tubes. See pages 413, 418.

2. *Fennel from Caraway.*—The former has 5 obtuse, conspicuous ribs, 4 oil-tubes on back, 2–4 on flat face; caraway has 5 filiform ribs, 6 oil-tubes. See pages 410, 415.

VI. **Seeds.** *Stramonium from Black Mustard and Colchicum.*—The former has albumin whitish, oily, enclosing cylindrical embryo, curved parallel with edge of seed; mustard has oily embryo, radicle curved, two cotyledons, one folded over the other; colchicum has albumin oily, horny, tough, enclosing small embryo opposite hilum, monocotyledonous. See pages 238, 502.

VII. **Powders.** 1. *Starches.*—Each starch has a characteristic sized and shaped granule dependent upon its source. As these, therefore, all differ, we only have to take several $\frac{1}{4}$ gr. (.016 Gm.) samples of a specimen and add to each a drop of water on a slide under a cover-glass—with $\frac{1}{5}$-inch objective we can readily recognize the predominating starch and identify all possible starchy adulterations; corn-starch (*official,* pages 80, 81) is mostly in pentagons and hexagons; rice-starch (page 81), similar, but only one-fifth size; wheat-starch (page 81), lenticular layer indistinct, hilum central, third larger than corn-starch; also notice starches of maranta (pages 81, 124), canna (page 125), curcuma (pages 81, 129), sago (pages 82, 88), ginger (page 127), cassava (pages 82, 357). All starches turn blue with iodine and swell with potash solution or diluted sulphuric acid.

2. *Ginger from Corn and Wheat Starch.*—The former contains normally about 20 p. c. of its own peculiar starch, whose granules are flat, and broadly ovate, but when seen edgewise, look long and narrow, with small hilum near narrow end, marked by many transverse lines. Resemble, but are smaller than granules of E. India arrowroot; corn- and wheat-starch added increases the amount beyond 20 p. c., and can be recognized by their characteristic shapes. See pages 81, 127.

3. *Cloves from Powdered Shells and Starch.*—The former is very simple, consisting of fragments of parenchyma-cells, having thin walls and a slight yellow color; a few long, stout, colorless bast-fibres and some small spiral vessels; no starch; shells consist of thick-walled stone-cells, lignified, with pore canals, etc. See pages 81, 399.

4. *Taraxacum from Chicory.*—The former consists of clear white fragments of parenchyma-cells, with occasional large vessels approach-

ing the scalariform in type; chicory is similar to taraxacum, except that the vessels are slightly smaller and more reticulate. Some latex tubes may also be seen. See pages 555, 557.

5. *Digitalis from Senna.*—The former has numerous multicellular hairs, which, having constrictions, appear to be formed of a number of elongated cells; senna, on the contrary, has many unicellular hairs having thick and rough cell-walls. See pages 276, 277, 512.

6. *Stramonium from Tobacco.*—The former has multicellular hairs somewhat resembling digitalis, while tobacco also has multicellular hairs, some having glands at their free extremities. See pages 502, 505.

7. *Kamala from Lupulin.*—The former consists of stellately arranged colorless hairs mixed with depressed globular glands, containing 40–60 club-shaped vesicles; lupulin consists of minute granules, subglobular or hood-shaped, reticulate, lower half obtusely conical. See pages 160, 359.

8. *Lycopodium from Pine-pollen.*—The former consists of granules that are tetrahedral, reticulated, rounded on one side and on the edge, with short projections; pine-pollen consists of an elliptic cell, at both ends of which is attached a globular cell. See pages 64, 65.

APPENDIX.

POISONS—TREATMENT AND ANTIDOTES.

Poisoning may be of two kinds: 1. Chronic, where small doses are repeated at more or less short intervals, thereby slowly establishing characteristic symptoms (arsenic, bromides, iodides, lead, etc.). A few drugs have been termed "criminal poisons" because when thus given, they produce effects partly imitative of certain diseases, hence preclude ready conviction of the guilty (arsenic, colchicum, tartar emetic, etc.). 2. Acute, where a single excessive dose is taken, which quickly produces alarming conditions, and it is this form of the subject that must be understood as here considered.

Some poisons produce specific symptoms, others have a more complex action, and consequently require a general treatment for antagonization; a few, being absorbed quickly, show almost immediate effect (hydrocyanic acid, strychnine, nicotine, reptile-venom, gases, etc.), while most give evidence of gradual ingestion for at least 15–30 minutes. All demand prompt medication and imply doubtful recovery, therefore in order to use all possible haste, both physicians and pharmacists should consider it imperative to not only have in mind the antidotes and specific treatments, but at ready command the many combating remedies. These are called antidotes, and may be (1) mechanical, which simply protect the stomach walls from the poison (starch, flour, demulcents, oil, etc.), (2) chemical, which by combination form less soluble and active compounds in the stomach (tannin, sodium and magnesium sulphates, lime water, magnesia, etc.), (3) physiological, which antagonizes the action of the drug after it gets into circulation (atropine—morphine, aconite—digitalis, etc.).

RATIONALE OF TREATMENT.

Excessive quantities of poisons frequently from the first vomit and purge freely *per se*, thereby largely correcting their own evil effects, but when neither of these conditions takes place, vomiting must at once be induced by either zinc sulphate, mustard, pump, apomorphine, etc.; next administer the proper chemical antidote (if one exists), or physiological antagonists (incompatibles) awaiting thereafter 15 minutes; now produce emesis, and wash out stomach with warm, or warm-medicated water, finally treat functional and organic symptoms (respiration, circulation, temperature) that may necessarily arise. In depressing poisons, as well as corrosive substances, emetics must be used cautiously, lest by wrenching we occasion greater exhaustion and possibly a rupture of the impaired stomach-wall; here the pump or syphon-tube is to be preferred. The bladder must be frequently emptied, if necessary by catheter, and in many cases a quick acting cathartic is of considerable advantage. Diffusible (cardiac) stimulants, artificial respiration, electricity, artificial heat, etc., are all at times of great service.

While it is true that most poisons claim specific and different treatment, yet for simplicity sake a few groups can be formed, each containing drugs amenable to like antagonism, thus—alkalies and alkaline salts are combated with weak acids, albumin, demulcents; acids and acid salts with weak alkaline solutions, albumin, demulcents, oil; alkaloidal drugs with tannin, coffee, tea; depressants with stimulants and *vice versa*, etc.

USUAL AGENTS EMPLOYED IN POISON CASES.

1. *Jeaunel's General Antidote.*—Either of the following formulas can be employed when the nature of the poison is doubtful, or for arsenic, digitalis, mercuric salts, opium, strychnine, and zinc salts, but is of no value for antimony compounds, caustic alkalies, or phosphorus:

℞. Liquor Ferri Tersulphatis,	℥ijss	(75 Cc.)	
Magnesii Oxidum,	℥ij	(60 Gm.)	
Carbo Animalis,	℥j	(30 Gm.)	
Aqua Fontana,	℥xx	(600 Cc.).	M.

Keep the last three ingredients always mixed, and add liquor when needed. Dose, ℥ij–3 (60–90 Cc.).

℞. Magnesii Oxidum,	℥ij	(60 Gm.)	
Carbo Ligni,	℥ij	(60 Gm.)	
Ferri Oxidum Hydratum,	℥ij	(60 Gm.)	
Aqua Fontana,	℥xij	(360 Cc.).	M.

Dose, *ad libitum.*

2. *Albumin, White of Egg.*—Dissolve 4 egg-whites in a quart of warm water—for mineral acids, mineral salts (corrosive sublimate, etc.), corrosive alkalies, aniline, creosote, bromine, chlorine, iodine, etc.

3. *Milk, Fatty Oils, Mucilaginous Substances.*—Substitutes for albumin—for corrosive salts, corrosive acids and alkalies (especially ammonia), but the two former never for cantharides, carbolic acid, copper salts, or phosphorus, whose absorption they promote.

4. *Castile Soap.*—Dissolve in 4 volumes of water, as a substitute for albumin—for corrosive acids, metallic salts (corrosive sublimate, potassium dichromate, tin and zinc salts), corrosive vegetable substances; harmful in alkaline poisoning, hence not to be used. Dose, ℥ij–12 (60–360 Cc.).

5. *Tannic Acid, Coffee, Tea.*—To precipitate the various alkaloids as insoluble tannates; *Potassium Permanganate*—for morphine, codeine, etc.; *Dialyzed Iron*—for arsenic; *French (Old) Oil of Turpentine*—as physiologic antidote for phosphorus; *Ammonia Water, Aro-*

matic Spirit of Ammonia, Brandy, Whiskey, Amyl Nitrite, Faradic Battery, etc.—for general stimulation.

6. *Vinegar, Dilute Mineral Acids.*—To neutralize alkalies and alkaline salts; *Magnesium Oxide, Sodium Bicarbonate, Calcium Carbonate, Sodium and Magnesium Sulphates*—for various acids and acid salts; *Charcoal,* animal and vegetable—for arsenic, corrosive sublimate, etc.; *Chloral Hydrate, Chloroform, Ether, Potassium Bromide*—as narcotics or anæsthetics in tetanic poisons.

7. *Emetics:* (1) Zinc Sulphate, gr. 5–15 (.3–1 Gm.), repeated twice if necessary, at 15-minute intervals, or until emesis is produced; (2) Mustard, ʒj–4 (4–15 Gm.), stirred to a cream with water; (3) Ipecac, gr. 15 (1 Gm.), repeated if necessary in 15 minutes; Apomorphine Hydrochlorate, 2 p. c. solution, ♏iij–5 (.2–.3 Cc. hypodermically); Stomach Pump, or Rubber Tubing (5–8 feet of ½ inch); Tartar Emetic, gr. ½ (.03 Gm.) in sweetened water, for children.

8. *Hypodermic Solutions:* (1) Atropine Sulphate, 1 p. c., ♏ij–6 (.13–.4)—as physiologic antidote for aconite, benzene, gelsemium, morphine, muscarine, opium, physostigmine, pilocarpine, etc.; (2) Pilocarpine Nitrate, 5 p. c., ♏x–15 (.6–1 Cc.)—as physiologic antidote for atropine, daturine, duboisine, hyoscyamine, etc.; (3) Morphine Sulphate, 10 p. c., ♏v–8 (.3–.5 Cc.)—for similar use as pilocarpine nitrate; (4) Strychnine Sulphate or Nitrate, 2 p. c., ♏ij–3 (.13–.2 Cc.)—as physiologic antidote for most depressants: acetanilid, aconite, chloral hydrate, chloroform, conium, physostigma. All of these should be used in an aseptic hypodermic syringe.

In cases of specific poisoning the following treatments are recommended:

Acetanilid, Antifebrin, Antipyrine, Phenacetin: Empty stomach, give recumbent position, plenty fresh air or oxygen (for cyanosis), loosen clothing around neck, chest and waist, stimulants (brandy, whiskey, ammonia), external heat, atropine or belladonna (to maintain blood-pressure), strychnine to aid respiration.

Acids: If these have been taken in concentrated form it is unwise to give emetics or use the pump, as either might tend to lacerate the softened œsophagus.

1. *Carbolic, Creosote, Resorcin:* The pneumogastric filaments, in mucous membrane of the stomach, are usually so obtunded as not to respond to emetics, so if thought safe empty stomach with pump or hypodermic apomorphine, or wash out with 10 p. c. sol. sodium bicarbonate (℥viij; 240 Cc.), following with antidote—magnesium or sodium sulphate (℥ij; 60 Gm.), in weak solution, to form harmless sulphocarbolate, then demulcent drinks, egg-white (to protect mucous surfaces, but no oils or glycerin; stimulate with whiskey, brandy, alcohol, ammonia, and if necessary digitalis, strychnine, warmth and friction to extremities (feet, hands), counter-irritants to abdomen, opium for pain, atropine. To local abrasions apply sodium carbonate solution, using same for mouth wash; the very dark-black urine and eschars serve to identify this poison.

2. *Chromic, Potassium Chromate and Dichromate:* Emetics, then magnesium oxide or carbonate, sodium bicarbonate or borate, chalk in water to a paste, demulcent drinks (flaxseed, elm, etc.), stimulant enemas.

3. *Hydrocyanic—Cyanides, Oil of Bitter Almond, Cherry Laurel Water:* Recumbent position, abundant fresh air, oxygen, smell chlorine water, or diluted chlorine gas, vomit, hypodermic atropine for heart, brandy, ether ammonia inhalations; if breathing ceases use artificial respiration, mild faradic current to the heart, alternate cold and warm affusions to head, chest and spine; ferrous and ferric sulphates followed by potassium carbonate solution yield insoluble Prussian blue (antidote), ferrous sulphate alone or with magnesia renders acid insoluble, but the action of the acid is so quick that, as a rule, antidotes avail little; ♏xv (1 Cc.) of official acid, or gr. 1 (.06 Gm.) of anhydrous acid usually is fatal in 15 minutes.

4. *Mineral—Hydrochloric, Nitric, Nitrohydrochloric, Sulphuric, Phosphoric, Glacial Acetic:* Neutralize with an alkaline solution—sodium, potassium, magnesium carbonate or bicarbonate, magnesia, lime, chalk or wall-plaster (H_2SO_4), dissolved or mixed with water, soapsuds, water freely, except with sulphuric, then demulcent drinks, gruel, egg-white, almond or olive oil, warmth and friction to extremities (feet, hands), emollient fomentations, brandy and whiskey for collapse, morphine for pain.

5. *Oxalic—Oxalates, Salt of Lemon (Potassium oxalate)*: Unless the poison has occasioned vomiting, empty stomach at once, then neutralize with chalk, whiting or wall-plaster in creamy paste with water, lime water, now vomit to recover insoluble calcium oxalate, give demulcent drinks, oils, opium for pain, hot fomentations to abdomen, friction to extremities (feet, hands), enema, much water to hasten elimination by kidneys; avoid potassium, sodium (alkaline) carbonates, as they form soluble oxalates; ℥ss–1 (15–30 Gm.) usually proves fatal.

Aconite, Aconitine, Pulsatilla: Evacuate and wash out well the stomach, unless symptoms severe, when vomiting must be avoided, if possible, and then in a towel without raising head; give recumbent position, absolute quietness, feet elevated (to confine circulation to vital centres, at base of brain), dry warmth to body, especially extremities (feet, hands), cardiac (diffusible) stimulants (brandy, whiskey, alcohol, ether, ammonia) by mouth or skin, digitalis for heart syncope (tincture ♏xxx; 2 Cc.), hypodermic atropine (♏iv; .26 Cc.), or strychnine (gr. $\frac{1}{20}$–$\frac{1}{10}$; .003–.006 Gm.) for cardiac and respiratory stimulation, tannin, amyl nitrite, oxygen, artificial respiration. Tincture of aconite ♏xxx–60 (2–4 Cc.), and aconitine gr. $\frac{1}{20}$ (.003 Gm.) have each proven fatal.

Alcohol, Alcoholism, Delirium Tremens: Drunkenness resembles somewhat opium-poisoning and brain concussion. Empty stomach, washing it out well with strong warm coffee, apply warmth to body and extremities (feet, hands), cold douche to head, plenty fresh air, interrupted current to respiratory muscles, inhale ammonia, amyl nitrite, artificial respiration, keep awake mechanically.

Alkalies, Potassa, Soda, Ammonia, Spirit of Hartshorn, Ammonia Smelling-salts, Carbonates: Neutralize with vinegar, lemon juice, diluted acetic acid, then give demulcent drinks, fatty oils, opium to relieve pain. For ammonia gas inhale warm acetic acid vapor, and antagonize chest-pain by few chloroform inhalations.

Alkaloids: Empty stomach at once, follow with tannin solution or strong coffee, tea, to form insoluble tannates.

Alum: This usually vomits *per se*, otherwise give emetic, then ammonium or potassium carbonate, demulcents.

Aniline (Dyes, Ink): Vomit with copper sulphate, or wash out well the stomach, give recumbent position, loosen clothing, abundant fresh air, oxygen, ether injections, ammonia, whiskey, brandy, strychnine, magnesia (gr. 30; 2 Gm.); ʒss–2 (2–8 Gm.) have proven fatal.

Antimony, Chloride, Wine, Tartar Emetic: These usually vomit actively *per se*, if not must empty stomach, giving abundance of warm water, follow with tannin solution, coffee, tea, gallic acid (to form insoluble tannates), demulcent drinks, egg-white, milk, warmth, friction, faradic current over heart, opium and stimulants in small and frequent doses, artificial respiration; magnesium and sodium carbonates can be used, also ferric hydroxide followed with opium or morphine for pain; magnesia in milk for the chloride; Tartar Emetic gr. 2–5 (.13–.3 Gm.) have killed, much larger doses have often failed.

Arsenic, Paris Green, Fly Stone or Powder, Fowler's Solution, Rough on Rats, Cobalt: Produce emesis unless this has occurred, washing out the stomach with much water, then give freshly precipitated ferric hydrate, made by double decomposition between any ferric solution, well diluted, and either ammonia water, well diluted, sodium carbonate or magnesia, the object being to envelop the poison mechanically and to form insoluble ferric arsenite or arsenate; usually give ʒj (4 Gm.), every 5 minutes, for eight doses, and follow with zinc sulphate, then castor oil; may give oils, demulcent drinks, egg-white, and stimulants for faintness and great depression, warmth to body, opium or morphine for pain, poultices and fomentations to stomach, flour, lime water, dialyzed iron, subcarbonate of iron, alkaline mineral waters.

Belladonna, Hyoscyamus, Stramonium, Duboisia, Dulcamara (Atropine, Hyoscyamine, Daturine, Duboisine, Solanine): Empty stomach, give tannin solution, strong coffee, tea by mouth or rectum, hypodermic morphine, physostigmine or pilocarpine (to antagonize nervous disturbance, delirium, etc.), then diffusible stimulants (whiskey, brandy, ammonia), caffeine, strychnine, cold to head, warmth and friction to extremities (feet, hands), artificial respiration.

Benzene, Nitro-Benzene, Oil of Mirbane: Empty stomach, give plenty fresh air, hypodermic atropine, alternate cold and hot water douches to chest, mild faradic current over heart, artificial respiration.

Bites. 1. *Dogs, Cats:* At once suck forcibly the wound, endeavoring also by squeezing to get out all blood possible, wash with warm water and cauterize well with lunar caustic; 2. *Snakes:* Apply cupping glass over wound, or tie the limb moderately tight above injured spot, allow to bleed freely, aiding by pressure, wash with warm water and cleanse thoroughly, cauterize with mineral acids or carbolic acid; cause perspiration by warm drinks, ammonia, wine, etc.; one with perfect mucous surface should forcibly suck wound, arsenic, if much prostration give liberally diffusible stimulants (whiskey, brandy, ammonia); bleed at one arm, transfuse blood or "normal salt solution" by the other; 3. *Insects, Bees, Wasps, Hornets:* Apply locally ammonia water or some alkaline solution, may saturate cloth with ammonia water or sodium chloride solution and lay over part until pain dispelled; remove sting by pressing a watch-key over it, give stimulants (ammonia, wine, etc.), may apply onion to wound, but not good.

Bromal Hydrate: Large doses kill in a few minutes, with contracted pupil, dyspnœa, and convulsions, death from failure of respiration; acts on heart muscle direct, much more powerful than chloral hydrate. Inhale abundant fresh air, ammonia, empty stomach, cardiac stimulants (strong coffee, alcohol, caffeine, digitalis), cold to head, warmth to extremities, strychnine, electricity, amyl nitrite, artificial respiration, quietness.

Bromine, Bromides: For bromine, if swallowed, give well diluted ammonia water, olive or almond oil; if inhaled then breathe ammonia vapor and abundant fresh air, for bronchial irritation inhale a little chloroform. For bromides give cardiac stimulants (strong coffee, caffeine citrate, digitalis), morphine is the best antagonist for mental symptoms, may give strychnine, ergot, belladonna, cathartics, diuretics.

Camphor: Empty stomach, give alcohol or brandy in small and frequent doses (best hypodermically), coffee, ether inhalations, alternate hot and cold douche, warmth to extremities by hot blankets, etc., opium and bromides for convulsions.

Cannabis Indica: Somewhat similar to opium and chloral hydrate. Emetics, lemon juice to neutralize, tannin, hot coffee, hypodermic atropine (gr. $\frac{1}{120}$; .00054 Gm., every 15 minutes for 3 doses), ammonia, strychnine, electricity to chest muscles, artificial respiration, keep awake, also body warm, empty bladder often.

Cantharides, Cantharidin: Empty stomach, give demulcent drinks freely (barley, elm, flaxseed tea, diluted egg-white, gruel or pure water), hypodermic morphine or tincture of opium (by mouth or rectum) to allay pain and gastro-enteritis; avoid oils and oily emulsions, as these favor solubility and absorption of cantharidin, stimulants, warmth to extremities, warmth and cataplasms to abdomen; powdered drug ʒss (2 Gm.) or tincture ℥j (30 Cc.) usually proves fatal.

Carbon Disulphide: Vomit, give potassium bromide and chloral hydrate (for nervous excitement), stimulants (to support circulation), inhale ammonia, warmth to body, cold douche to head, artificial respiration.

Castor Beans: Vomit at once, give demulcent drinks, opium for pain and to quiet violent symptoms, which resemble those of cholera; 3 seeds, also 20, have each killed in 2 and 5 days.

Chloral Hydrate: Empty stomach, give coffee by mouth or rectum (using tube if necessary), abundant fresh air, friction, cataplasms to limbs and over heart, hypodermic strychnine or picrotoxin every 15 minutes, keep awake by coffee, caffeine, flagellation, shaking, shouting, ammonia to nostrils, cold to head; if serious give recumbent position, absolute rest, amyl nitrite inhalations (to stimulate heart), artificial respiration; ʒss–1 (2–4 Gm.) has killed.

Chloroform, Ether, Nitrous Oxide Gas: Withdraw at once the inhalation, lower well the head, pull tongue forward, to admit fresh air, compress and relax chest, ammonia and amyl nitrite inhalations, warmth and friction to extremities, hot and cold douche, weak current—one pole on the larynx, other on the pit of stomach; if heart stopped give several taps over that region, inhale ammonia, brandy, atropine, strychnine, artificial respiration. If swallowed treat as in chloral hydrate; vomit, enema of hot coffee, draughts of water containing sodium carbonate or bicarbonate, ammonia, warmth; chloroform inhalation kills 1 in every 3,000; ether 1 in every 16,000; nitrous oxide gas 1 in every 300,000.

Chlorates, Nitrates (Potassium, Sodium, etc.): Vomit, plenty of water and demulcent drinks for dilution, amyl nitrite, opium for pain, hot fomentations to loins; avoid stimulants increasing kidney congestion; ʒviij–12 (30–45 Gm.) usually prove fatal in a few hours.

Chlorine Water, etc.: Give emetic, warm water, then milk, egg-white (albumin), flour with water or lime water, ammonia water.

Cocaine, Eucaine: Similar to belladonna, etc., as they closely resemble atropine in action on pulse, pupils, respiration, sweat-glands and bowels. Empty stomach, give tannin, morphine (best antidote), then in sequence chloral hydrate, chloroform, ether, alcohol, amyl nitrite to stimulate heart, strychnine, artificial respiration, caffeine, ammonia inhalations.

Colchicum (Wine, Tincture, Extract, Fluid Extract, etc.): Unless vomiting and purging have already occurred, induce at once the former, give tannin (gr. 30; 2 Gm.), gallic acid, strong coffee or tea, abundant water, demulcent drinks, morphine or opium to allay pain, purging and heart depression, cardiac (diffusible) stimulants, hot fomentations to abdomen, keep extremities (feet, hands) warm; powdered root gr. 50 (3.3 Gm.), seeds ʒiv (15 Gm.), root wine ʒiv (15 Cc.), have each proven fatal.

Conium, Conine: Emetics or lavage, tannin, strong coffee, tea, again wash out stomach, external warmth (hot wraps, bags, bottles, etc.), epispastics, alcohol, stimulants, strychnine, picrotoxin, hypodermic atropine, artificial respiration, castor oil; conine ♏j–2 (.06–.13 Cc.), usually fatal in 1–3 hours.

Colocynth, Elaterium, Elaterin: Empty stomach, give demulcent drinks, enemas, opium for pain (small doses), warm bath, stimulants (brandy, whiskey, etc.).

Croton Oil: Empty stomach, give hypodermic morphine or laudanum, every 20 minutes until pain and purging abated, demulcent drinks, mucilage, milk, egg-white, olive oil, soup, spirit of camphor, stimulants, warmth and friction; ʒss–2 (2–8 Cc.) have killed in 4–6 hours.

Curarine, Woorare, Urare: If wounded ligate above injury, suck forcibly and wash well with alkaline solution (potassium permanganate), warmth to loins, abundant water, spirit of nitrous ether (to aid urine elimination), artificial respiration, empty bladder often; resembles digitalis much more than it does strychnine.

Digitalis, Convallaria, Scoparius, Strophanthus, Apocynin, Scillain, Scillitin: Vomit or wash out the stomach well with warm water and tannin, strong coffee, tea; keep reclined, never allowing erect position, as that may cause fainting to death; aconitine (gr. $\frac{1}{200}$; .0003 Gm.), or tincture of aconite (♏v; .3 Cc.) best to large quantities, opium best to long usage, saponin and senegin best physiological antagonist, diffusible stimulants by mouth or rectum, warmth and friction to extremities (feet, hands); powdered drug ʒss (2 Gm.), tincture ʒij–4 (8–15 Cc.) have proven fatal.

Ergot: Empty stomach, give plenty warm drinks, tannin, coffee, tea, quick purgative (croton oil ♏j; .06 Cc.), recumbent position, small doses of opium at intervals for pain and irritation, nitro-glycerin occasionally (gr. $\frac{1}{50}$; .0013 Gm.), hot baths, warmth, friction (to maintain circulation), stimulants, amyl nitrite.

Gamboge, Scammony: If vomiting and purging have not occurred, induce former by usual emetics, may give solution of potassium or sodium carbonate, magnesia in milk, demulcent drinks, and enemas, opium in small doses to allay pain and purging.

Gelsemium, Gelsemine: Emetic or wash out stomach with tannin solution, then hypodermic atropine and morphine, warmth and friction, cardiac stimulants (digitalis, alcohol, coffee, ammonia), artificial respiration, electricity, rouse patient by cold and hot douche; fluid extract ʒj (4 Cc.), or tincture ʒiv (15 Cc.) is usually fatal.

Gases: 1. *Chlorine:* Inhale cautiously ammonia or hydrogen sulphide, steam often valuable for breathing, abundant fresh air, egg-white, milk, flour, lime water, demulcent drinks, chloroform or ether inhalations for cough; 2. *Hydrogen Sulphide:* Chlorine gas well diluted with air cautiously inhaled, fresh air; 3. *Illuminating Gas, Carbon Dioxide, Carbon Monoxide:* Remove clothing, open doors and windows, abundant air, oxygen, horizontal position, alternate cold and warm douche to chest and head, ammonia inhalations, diluted chlorine gas carefully breathed, faradic current to extremities, alcohol by mouth or rectum, strong coffee by enema, artificial respiration, venesection, warmth to body and limbs, quiet bed, circulating air, cold acid drinks freely.

Glass—coarse or powdered: Large quantity of bread crumbs as an envelope, then emetics.

Hyoscine: Similar to belladonna, but chloral hydrate is used here with great advantage.

Iodine: Give starch in hot water, or flour in warm water, farinaceous substances (rice, arrowroot, gruel, etc.), then vomit, demulcent drinks, egg-white in milk, sodium bicarbonate, stimulants (alcohol, digitalis, amyl nitrite), atropine, strychnine, opium or morphine for pain.

Ipecac: Unless thoroughly vomited, empty stomach, washing it out with tannin solution, if necessary follow with opium, belladonna, cardiac (diffusible) stimulants.

Iodoform, Iodol, Aristol: Give potassium bromide, to dissolve iodine compound, lemonade, potassium acetate solution, stimulants, diaphoretics, warm sponge bath, small repeated doses of tincture of opium, large doses of potassium bicarbonate, diluents freely.

Lead and Barium Salts: Give magnesium or sodium sulphate (℥ss; 15 Gm.) in a glass of water to form insoluble sulphate, then vomit, follow with purgative enema, demulcent drinks, milk, egg-white, diffusible stimulants, opium for pain; for lead colic apply hot water bag, hot fomentations; for chronic lead poisoning, recognized by blue line (sulphide) along margin of gums, drop-wrist (extensors paralyzed), constipation, etc., give iodides to saturation (sodium and calcium being best), sulphur or sulphurated potassa baths, sulphuric acid, friction to muscles, calomel, lemonade, strychnine, faradic current.

Lobelia: If patient has failed to vomit use emetic, follow with tannin, cardiac and respiratory stimulants, strychnine or picrotoxin hypodermically, opium, thebaine, alcohol, digitalis, atropine, ergot; caustic alkalies decompose lobeline, also preparations; ʒj (4 Gm.) has killed.

Mercury and Copper Salts (*Corrosive Sublimate, Nitrate, White Precipitate, etc.*): Give egg-white, beaten up with water (one egg for every 4 grains (.26 Gm.) of corrosive sublimate), follow with emetic at once, to avoid resolution, after this demulcent drinks, stimulants, warmth, friction, opium or morphine for pain; in the absence of egg-white, use flour-paste, or milk, or meat-broth; for copper salts may give additionally reduced iron, weak solution of potassium ferrocyanide, then potassium iodide until system saturated to promote elimination; tannin, strong coffee, tea useful in combating these metallic salts; for salivation use bismuth, sodium sulphite, weak nitric or sulphurous acid, belladonna to diminish ptyalism; corrosive sublimate gr. 3–5 (.2–.3 Gm.), is usually fatal in ½–2 days; copper sulphate and acetate ʒviij (30 Gm.) and ʒiv (15 Gm.) respectively, have killed in 4–12 hours.

Mezereum: Evacuate stomach with warm albuminous or mucilaginous drinks, then milk, fatty oils, demulcent enemas, opium for depression, cold poultices to abdomen.

Mushrooms, Poisonous Fungi, Muscarine: Empty stomach, give hypodermic atropine or tincture of belladonna, tannin, castor oil and enema to remove fungi from lower bowel, alcoholic stimulants, warmth, friction, poultice to abdomen.

Nitroglycerin, Amyl Nitrite: Give atropine, strychnine, picrotoxin, digitalis to increase functional activity of spinal cord, and sympathetic system, stimulants, artificial respiration, alternate cold and hot douche to head, ergotin.

Opium, Lactucarium, Morphine, Codeine, Laudanum; etc.: If taken by mouth, give at once ½ p. c. solution of potassium permanganate (℥viij; 240 Cc.), then empty stomach by pump, apomorphine, etc., washing it out well with strong hot coffee, leaving therein at least a pint (.5 L.), tannin solution, keep body warm but alternate hot and cold douche to the head, hypodermic atropine and strychnine as respiratory stimulants (every 15 minutes for three doses), electricity to chest muscles, artificial respiration, digitalis as heart stimulant, ammonia inhalations, amyl nitrite, keep awake by shaking, flicking with a towel, cold water over face and chest, walking between attendants; evacuate bladder often to prevent reabsorption. If poison taken hypodermically, proceed as outlined omitting chemical antidote and vomiting; opium gr. 5 (.3 Gm.), or morphine gr. 1 (.06 Gm.) usually prove fatal in 5–12 hours.

Phosphorus, Rat Paste, Matches: Empty stomach, preferably with copper sulphate (gr. 3; .2 Gm., repeated 2–4 times at five-minute intervals) to form insoluble black phosphide, follow every half hour with old viscid (oxygenated, acid, French) oil of turpentine (ʒj; 4 Cc.), floated on water, follow with magnesium sulphate (℥j–3; 30–90 Gm.) in a glass of water as a cathartic; may give hydrated magnesia, lime water, charcoal. If the phosphorus be taken in solution, give potassium permanganate to cause oxidation, opium for pain; albumin, egg-white valuable, but never fats or fatty oils as these are solvents hence aid its absorption; empty bladder often; phosphorus gr. 1 (.06 Gm.) is usually fatal in 1–5 days.

Physostigma, Physostigmine (Eserine): Evacuate stomach, give tannin, coffee, tea, hypodermic atropine every 15 minutes until pupils dilated and pulse strong; if this should fail give chloral hydrate (gr. 10; .6 Gm.) at same intervals, or hypodermic strychnine, then cardiac stimulants (alcohol, coffee, digitalis, ammonia), artificial heat and respiration, electricity; empty bladder often; six seeds have killed.

Phytolacca: Similar to aconite and veratrum, but unlike the latter in that vomiting comes much more slowly; within 2 hours usually acts *per se* as an emeto-cathartic, after which give cardiac stimulants (alcohol, ammonia, ether, digitalis, etc.), opium for pain.

Pilocarpus, Pilocarpine: Similar to physostigma; evacuate stomach, washing it out well with tannin solution, follow with hypodermic atropine (gr. $\frac{1}{60}$; .001 Gm.), or tincture of belladonna (♏xx; 1.3 Cc.), every 20 minutes until pupils dilated; morphine to control nausea and vomiting, cardiac (diffusible) stimulants.

Ptomaines: Toxic alkaloids in meat, sausage, pork, fish, lobster (canned or otherwise), poisoned game, putrescent food, cheese, etc.): Empty stomach at once, using large draughts warm water, tannin, coffee, tea, castor oil as a purgative; after this operates give diluted vinegar, sponging the body with same, weak alkaline solution, alcoholic stimulants for depression, warmth to abdomen, friction to extremities, opium for any spasms.

Savin, Sabina Oil and Tops, Tansy and Oil: If not already vomited give at once an emetic, move bowels freely with Epsom salt, castor oil (full dose), stimulants, allay pain with morphine and demulcents, flaxseed meal poultice to stomach.

Poison Oak, Ivy: Apply at once locally soap, water with scrubbing brush, then lead water, alkaline solutions (sodium bicarbonate, sulphite, chlorinated, dil. ammonia, soapsuds, alum curd), tincture or infusion of lobelia, grindelia, sassafras, cocaine solution, aristol, opium; internally cooling drinks, low diet, saline purgatives, quietness.

Quinine, etc.: Give potassium bromide, hydrobromic acid, cardiac and respiratory stimulants; morphine counteracts cerebral action, atropine the nervous, cardiac and antipyretic effects.

Silver Salts, Nitrate, Lunar Caustic: Give sodium chloride (table salt) ʒiv (15 Gm.), dissolved in a glass warm water to form insoluble silver chloride, or use egg-white, or milk, follow with emetic and large draughts of warm water, demulcent drinks; may use alkalies, alkaline carbonates, lime water, tannin. For long usage, give purgatives, diuretics, potassium iodide, sodium hyposulphite baths.

Straphisagria, Stavesacre: Similar to aconite and veratrum; evacuate stomach, then tannin, charcoal, diffusible stimulants, keep quiet, recumbent, feet elevated, extremities warm; chloroform inhalations for spasms, or chloral hydrate (gr. 30; 2 Gm.), or potassium bromide (ʒj–2; 4–8 Gm.); use all haste as death is by asphyxia.

Strychnine, Brucine, Nux Vomica, Ignatia, Picrotoxin, Cocculus Indicus, Hydrastis: Remove patient from all noise, quickly evacuate stomach, give tannin (gr. 30; 2 Gm.) dissolved in water, or iodide of starch to form insoluble strychnine perhydroiodide, charcoal; control spasms by inhaling chloroform or ether, or by large doses of chloral hydrate and potassium bromide in solution by mouth or rectum, thus keeping up gentle narcosis for several hours if necessary; spasms may stop respiration, hence control these at all risk, amyl nitrite, artificial respiration, soluble iodides, tobacco, opium, physostigmine, atropine, conium, Indian hemp; empty bladder often; nux vomica gr. 30 (2 Gm.), or extract gr. 3 (.2 Gm.), or strychnine gr. ½–1 (.03–.06 Gm.) is each usually fatal in ¼–3 hours.

Tobacco, Nicotine: Induce vomiting if not already accomplished, give quietness, recumbent position, tannin, strong coffee, tea, then an emetic, hypodermic strychnine (physiological antidote) or tincture of nux vomica by mouth, diffusible stimulants (alcohol, brandy, whiskey, ether, etc.), warmth to body, ergot, digitalis, belladonna, iodides, artificial respiration, cold douche to head; nicotine ♏xv–60 (1–4 Cc.), is fatal in 1–3 hours.

Tin Salts: Empty stomach, then milk of magnesia, demulcent drinks, opium for pain.

Turpentine: Emetics, if no purging give enema, then plenty of water and demulcent drinks, hot fomentations to loins, opium to allay pain.

Zinc Salts, Sulphate, Chloride, Burnett's and Platt's Solutions: Should vomiting not have occurred give plenty warm water containing sodium carbonate or bicarbonate to form insoluble zinc carbonate, or mustard (ʒij; 8 Gm.), then egg-white and milk, tannin solution, strong coffee, tea, to form insoluble tannate, opium, morphine, hot fomentations to allay abdominal pain; sulphate ʒxij (45 Gm.) is usually fatal.

Veratrum Viride, Veratrum Album, Veratrine, Sabadilla: Evacuate stomach, unless veratroidine constituent has thus acted, give recumbent position, feet elevated, dry warmth to body (wraps, blankets, bottles, etc.), tannin, strong hot coffee, tea, cardiac (diffusible) stimulants (alcohol, brandy, ammonia, etc.), atropine to antagonize cardiac depression, strychnine as respiratory and nervous stimulant, morphine, electricity, artificial respiration.

PRESCRIPTION WRITING OF THE PHYSICIAN.

Prescriptions (L. *præscriptio*, a writing before, an order; fr. *præscrib(o)-ere*, to write before, to ordain) are *ex tempore formulæ* written in Latin, usually at the bed-side, to combat specific conditions, and in their construction certain rules, forms and requisites must be observed:

1. *Chirography.*—Learn to write legibly, letting your style be plain, neat, thoroughly intelligent without leaving any possible ambiguity or doubt for the compounder as to what is intended. Make this your first imperative duty, and if, when a student, your penmanship is indifferent, then at once begin the trial for improvement; this can and will alone come by careful practice, so make sure that you know how to write before knowing what to write.

2. *Prescription Blanks.*—Do not be careless as to the kind and style of paper used. It is well to have uniformity in blanks, and whenever your regular supply becomes exhausted, if possible, replenish at once, using in the interim good, white, unruled paper cut to a specific size. A neglect of this might occasion discourteous remarks somewhere along the line (by attendant, compounder, etc.), which should and can easily be avoided. Blanks are, as a rule, furnished gratuitously by the druggists (who are only too well pleased to have the number great), and in size should be neither too large nor too small, but in keeping with the boldness of individual handwriting. On the other hand, when the style and printing of those supplied are not satisfactory, then others more to one's liking should be secured from the printer at your own expense.

3. *Weights and Measures.*—Of these we can employ three systems:

1. Avoirdupois (Imperial). This has the following subdivisions, grain (gr.), drachm (drm.), ounce (oz.), pound (lb.), and is thus proportioned: 27.35 grains make 1 drachm, 16 drachms make 1 ounce (437½ grs.), 16 ounces make 1 pound (7,000 grs.), 27.35—437½—7,000. By this system all substances are sold except precious stones, precious metals, and drugs when prescribed by a physician directly or indirectly for sickness.

2. Apothecaries' (Troy). This has the following subdivisions, grain (gr.), scruple (℈), drachm (ʒ), ounce (℥), pound (lb.), and is thus

proportioned: 20 grains make 1 scruple, 3 scruples make 1 drachm, 8 drachms make 1 ounce, 12 ounces make 1 pound, 20—60—480—5,760. The difference between the two pounds mentioned is 1,240 grains, the two ounces 42 grains, the two drachms 32.65 grains. The grain, however, is the same the world over, and is the *unit of weight.*

United States Fluid, Liquid or Wine Measure. This has the following subdivisions, minim (♏), fluidrachm (fʒ), fluidounce (f℥), pint (O), gallon (Cong.), and is thus proportioned: 60 minims make 1 fluidrachm, 8 fluidrachms make 1 fluidounce, 16 fluidounces make 1 pint (2 pints make 1 quart), 8 pints (4 quarts) make 1 gallon, 60—480—7,680—61,440 (58,340 grs.). The minim is the *unit of capacity*, and weighs 0.95 of a grain, the ounce weighing 455.7 grains.

Imperial Liquid Measure (Gt. Britain). This has the following subdivisions, minim (min.), drachm (fl. dr.), ounce (fl. oz.), pint (O), gallon (C), and is thus proportioned: 60 minims make 1 drachm, 8 drachms make 1 ounce, 20 ounces make 1 pint, 8 pints make one gallon, 60—480—9,600—76,800 (70,000 grs., or 10 lbs. Avd.). This minim weighs 0.91 of a grain, the ounce weighs 437.5 grains. It is thus seen that we have two minims (0.95—0.91 grain) and three ounces (437.5—455.7—480 grains).

3. Metric, Decimal or French. This system is based upon the Earth's polar circumference (24,818 miles), of which the one-forty-millionth part, 39.37 inches, is taken as the *unit of length* (metre); of the metre one-tenth, 3.93 inches, is taken, and upon it a cube constructed, which contains of distilled water 1,000 Cc. or Gm., and this furnishes the *unit of capacity* (litre); again of the metre the one-hundredth part, .393 of an inch, is taken and upon it a cube constructed, which contains of distilled water 1 Cc., weighing 15.434 grains, and this furnishes the *unit of weight* (gramme).

Milli-metre, mm.,	-litre, ml.,	-gramme,	mg. =	.001
	(Cubic centimetre, Cc.)			
Centi-metre, cm.,	-litre, cl.,	-gramme,	cg. =	.01
Deci-metre, dm.,	-litre, dl.,	-gramme,	dg. =	.1
METRE, M.,	LITRE, L.,	GRAMME,	Gm.=	1.
Deka-metre, Dm.,	-litre, Dl.,	-gramme,	Dg. =	10.
Hecto-metre, Hm.,	-litre, Hl.,	-gramme,	Hg. =	100.
Kilo-metre, Km.,	-litre, Kl.,	-gramme,	Kg. =	1000.
Myria-metre, Mm.,	-litre, Ml.,	-gramme,	Mg. =	10000.

Here every unit is multiplied or divided by 10, consequently each preceding denomination is just 10 times smaller than the one that follows, thus it takes 10 millimetres to make 1 centimetre, 10 centimetres to make 1 decimetre, etc.

4. *Prescription.*—This consists of four parts: 1. Superscription (date, name and address of patient; also regular sign, ℞, fr. L. *recipio*, to take; *recipe*, take thou); 2. Inscription (the body, consisting of *basis* or chief ingredient, *adjuvant* or assistant to basis, *corrective* or anything to correct the injurious quality of the two preceding, *vehicle* or *excipient* to make it pleasant and of suitable form; 3. Subscription

(directions to the compounder, usually in Latin); 4. Signature (directions for taking, also physician's name, in English).

A prescription may consist of a single article, the base, and although the fewer the drugs combined often the better, yet sometimes much good results from mixing several, as in the case of cathartics, where different ones act upon various portions of the canal. Every article should be written in the Latin genitive, and if of several parts each must receive this ending. It is, however, very seldom that the physician adheres absolutely to this rule, as he so often omits terminations and otherwise abbreviates, a habit that frequently gives ambiguity and misplaces the compounder.

Words having nominative in *a*, have genitive in *æ;* those in *us, um, os, on = i; as = atis; is = idis, eris, itis; o = onis, inis*, etc. The quantities are governed by the verb *recipio*, hence are in the objective case, and when expressed in Latin nomenclature, which is very rare, must be placed in the accusative. The English of the average prescription has about this form: Take thou (imp.) of drugs (gen.) certain quantities (acc.), mix thou (imp.), let (thou) a solution, mixture, pills, etc. (nom. s. or pl.), be made (sub. used as passive imp.).

Superscription.	℞.	FOR MR. BONAPARTE, 1241 ST. PAUL ST., Oct. 15, 1900.			
Inscription.	(Basis.)	Morphinæ Sulphatis,	gr. iv	0.26	Gm.
	(Adjuvant.)	Sodii Bromidi,	ʒij	8.	Gm.
	(Corrective.)	Syrupi Aurantii,	℥j	30.	Cc.
	(Vehicle.)	Aquæ Cinnamomi, q. s. (ad)	℥iv	120.	Cc.
Subscription.		M., ft. mist. (sol.).			
Signature.	S. (Sig.).	Teaspoonful every 3 hours.			
			DR. MITCHELL.		

5. *Abbreviations.*—Only such as are in common use, along with accustomed signs should be employed as: ℈, ʒ, ℥, ♏, M, O, S, aa, ad, gr., gtt., ft., lb., et, ss, q. s., sig., cong., misce, mist., cap., chart., emul., pil., solv., sol., pulv., etc. The following should always be avoided: Aconit. (for aconitine, aconitum), ammon. (ammonia, ammoniacum), aq. chlor. (aqua chlori, aqua chloroformi), chlor. (chlorine, chloral, chloroform), hyd. chlor. (calomel, corrosive sublimate, hydrate of chloral), sod. sulph. (sod. sulphite, sulphide, sulphate), zinc phos. (zinc phosphate, zinc phosphide), ac. hydroc. (acid hydrochloric, acid hydrocyanic dilute), ext. col. (extract colchicum, extract colocynth), sod. hypo. (sodium hyposulphite, or hypophosphite), aq. fortis (for aq. fontis), etc.

6. *Essentials.*—After having made the diagnosis, then carefully consider the medicines most desirable, their demanded quantities and number of doses, trying never to prescribe more than necessary. See that the doses are neither too large nor follow each other so often as to endanger life—smaller and oft-repeated ones always being advisable. Avoid combining in one prescription medicines that will form poisonous compounds, physiological incompatibilities, or chemical decomposition. Let prescriptions be as simple as possible, having the smallest number of ingredients that will secure the desired effect. Always read

them over carefully before finally handing same to attendant, and rewrite rather than permit a visible correction to exist. Large doses should always be underscored with a heavy line by the physician, and when desiring certain prescriptions not to be repeated, he should so mark the blank with the two words *non-repetatur*. When incompatibilities are intentional they should be so indicated by a marginal note; when otherwise the pharmacist will consider it his duty and privilege to make the necessary correction or remedy.

TABLE OF COMPARISON BETWEEN METRIC, AVOIRDUPOIS AND APOTHECARIES' WEIGHTS.

Names.		Numerical Expressions.	Equivalents in Grains.	Equivalents in Avoirdupois Weight.			Equivalents in Apothecaries' Weight.		
		Gm.	Gr.	lb.	oz.	gr.	℥	ʒ	gr.
Milligramme,	Mg. (mg.)	0.001	0.01543	0	0	$\frac{1}{64}$	0	0	$\frac{1}{64}$
Centigramme,	Cg. (cg.)	0.01	0.15432	0	0	$\frac{1}{6}$	0	0	$\frac{1}{6}$
Decigramme,	Dg. (dg.)	0.1	1.54323	0	0	1.5	0	0	1.5
Gramme,	Gm. (gm.)	1.0	15.43235	0	0	15.4	0	0	15.4
Dekagramme,	Dg.	10.0	154.32356	0	$\frac{1}{4}$	45.0	0	2	34.0
Hectogramme,	Hg.	100.0	1543.23563	0	$3\frac{1}{2}$	12.0	3	1	43.0
Kilogramme,	Kg.	1000.0	15432.35639	2	$3\frac{1}{4}$	10.47	32	1	12.4
Myriagramme,	Mg.	10000.0	154323.56390	22	$\frac{1}{2}$	14.8	321	4	3.5

In writing prescriptions physicians usually consider 1 Gm. as being 15 gr., 4 Cc. as 1 fluidrachm, 30 Cc. as 1 fluidounce.

TABLE OF COMPARISON BETWEEN METRIC AND APOTHECARIES' FLUID MEASURE.

Cubic Centimetre.	Minims.	f℥	fʒ	♏
0.06163	1.0			
0.30815	5.0			
0.61630	10.0			
1.0	16.23			
5.0	81.15		1	21.15
10.0	162.30		2	42.3
20.0	324.60		5	24.6
30.0	486.90	1	0	6.9
40.0	649.20	1	2	49.2
50.0	811.50	1	5	31.5
60.0	973.80	2	0	13.8
70.0	1136.10	2	2	56.1
80.0	1298.40	2	5	38.4
90.0	1460.70	3	0	20.7
100.0	1623.00	3	3	3.0
250.0	4057.50	8	3	37.5
500.0	8115.00	16	7	15.0
1000.0	16230.00	33	6	30.0

CORRESPONDING VALUES WHICH SHOULD BE MEMORIZED BY EVERYONE.

1 millimeter, Mm. (mm.) = $\frac{1}{25}$ of an inch. 1 centimeter, Cm. (cm.) = $\frac{2}{5}$ of an inch.
1 inch = 25 millimeters or $2\frac{1}{2}$ centimeters.
1 cubic centimeter, Cc. (cc.) = 16.23 minims. 1 fluidounce = 29.53 Cc. (cc.).
1 gramme, Gm. (gm.) = 15.4324 grains. 1 grain = 0.0648 gramme.
1 milligramme, Mg. (mg.) = 0.01543 = $\frac{1}{46}$ grain. 1 litre, L. = 34 fluidounces = $2\frac{1}{8}$ pints.

Rule.—To convert grains (whole) into metric, multiply the metric equivalent of one grain—0.0648, by the number of grains in question, say 30, thus 0.0648 × 30 = 1.944 Gm.; for fractions of grains divide the denominator of the fraction into 0.0648, and multiply quotient by numerator—say $\frac{1}{64}$, thus 0.0648 ÷ 64 = 0.001 × 1 = 0.001 Gm.

MEASURES OF APPROXIMATION.

While these equivalents are not precisely accurate, their values have so long been recognized by laymen on the one hand, and physicians on the other that they will possibly always be thus accepted.

A drop	♏j	.06	Cc.
A teaspoonful	fʒj	4	Cc.
A dessertspoonful	fʒij	8	Cc.
A tablespoonful	fʒiv	15	Cc.
A wineglassful	f℥ij	60	Cc.
A teacupful	f℥iv	120	Cc.
A tumblerful	f℥viij–xj	240–325	Cc.
A breakfastcupful	f℥viij	240	Cc.

Another likely source of error in weights and measures arises from quantities purchased in original containers from the manufacturers. Thus we speak of drachm vials of morphine sulphate, which in point of fact contain only one-eighth of 437.5 grs.—indeed, all solids when thus purchased have per ounce only the 437.5 grs., yet per pound sixteen times this amount, or 7,000 grs. With liquids the result is often much more misleading, especially of those having low or high specific gravities. These are mostly sold originally by weight, which allows the bulk often to be at variance with what some might expect.

1 ℔	473 Gm.	Sulphuric Acid	f℥8⅓	250	Cc.
1 ℔	473 Gm.	Liq. Ferri Subsulph.	f℥10	296	Cc.
1 ℔	473 Gm.	Chloroform	f℥10⅓	305	Cc.
1 ℔	473 Gm.	Syrup Simp.	f℥11¾	350	Cc.
1 ℔	473 Gm.	Glycerin	f℥12¼	360	Cc.
1 ℔	473 Gm.	Liquor Plumbi Subacetatis	f℥12⅛	380	Cc.
1 ℔	473 Gm.	Aqua Ammoniæ (10 p. c.)	f℥16	473	Cc.
1 ℔	473 Gm.	" " (28 p. c.)	f℥17	503	Cc.
1 ℔	473 Gm.	Spiritus Ætheris Nitrosi	f℥18¼	540	Cc.
1 ℔	473 Gm.	Essential Oil	f℥13–18	385–532	Cc.
1 ℔	473 Gm.	Æther	f℥21⅛	625	Cc.

TABLE GIVING THE MAXIMUM QUANTITIES THAT SHOULD BE PRESCRIBED UNLESS SPECIAL DIRECTIONS ACCOMPANY THE PRESCRIPTION.

	Single doses.			Total amount in any one day.		
Acid Arsenous	gr. ⅙	.01	Gm.	gr. ½	.03	Gm.
Acid Hydrocyanic Dilute	♏x	.6	Cc.	♏xxx	2	Cc.
Acid Nitromuriatic	♏v	.3	Cc.	♏xxx	2	Cc.
Aconite Leaf, Extract of	gr. 1½	.1	Gm.	gr. 10	.6	Gm.
Aconite Root, Fluid Extract of	♏v	.3	Cc.	♏xv	1	Cc.
Aconite Root, Tincture of	♏vj	.4	Cc.	♏xv	1	Cc.
Aconite Root, Fleming's Tincture of	♏iij	.2	Cc.	♏x	.6	Cc.
Aconitine and its salts	gr. $\frac{1}{50}$	.0013	Gm.	gr. $\frac{1}{10}$	.006	Gm.
Arsenic Chloride, Solution of	♏vj	.4	Cc.	♏xv	1	Cc.
Arsenic Iodide	gr. ⅙	.01	Gm.	gr. ½	.03	Gm.

	Single doses.			Total amount in any one day.		
Arsenic and Mercury, Solution of Iodides of	♏xx	1.3	Cc.	♏lx	4	Cc.
Arsenite of Potassium, Solution of	♏xv	1	Cc.	♏xlv	3	Cc.
Atropine and its salts	gr. 1/60	.001	Gm.	gr. 1/20	.003	Gm.
Belladonna, Extract of	gr. 1	.06	Gm.	gr. 5	.3	Gm.
Codeine	gr. 2	.13	Gm.	gr. 5	.3	Gm.
Coniine	gr. 1/16	.004	Cc.	gr. ½	.03	Cc.
Conium, Extract of	gr. 2	.13	Gm.	gr. 8	.5	Gm.
Croton Oil	♏ij	.13	Cc.			
Digitalin	gr. 1/50	.0013	Gm.	gr. 1/20	.003	Gm.
Digitalis, Extract of	gr. ½	.03	Gm.	gr. 1	.06	Gm.
Hyoscyamus, Extract of	gr. 3	.2	Gm.	gr. 10	.6	Gm.
Ignatia, Extract of	gr. 3	.2	Gm.	gr. 10	.6	Gm.
Cannabis Indica, Extract of	gr. 1	.06	Gm.	gr. 5	.3	Gm.
Corrosive Sublimate	gr. ¼	.016	Gm.	gr. ¾	.05	Gm.
Mercuric Iodide, Red	gr. ¼	.016	Gm.	gr. 1	.06	Gm.
Mercurous Iodide, Yellow	gr. 1	.06	Gm.	gr. 3	.2	Gm.
Morphine and its salts	gr. ½	.03	Gm.	gr. 2	.13	Gm.
Nux Vomica, Extract of	gr. 2	.13	Gm.	gr. 8	.5	Gm.
Opium	gr. 2	.13	Gm.	gr. 10	.6	Gm.
Opium, Extract of	gr. 1	.06	Gm.	gr. 4	.26	Gm.
Opium, Tincture of	♏xxx	2	Cc.	♏cxx	8	Cc.
Phosphorus	gr. ⅕	.013	Gm.	gr. ½	.03	Gm.
Physostigma, Extract of	gr. ¼	.016	Gm.	gr. 1	.06	Gm.
Potassium Cyanide	gr. ¼	.016	Gm.	gr. 1	.06	Gm.
Sodium Arsenate	gr. ⅓	.02	Gm.	gr. 1	.06	Gm.
Stramonium Leaves, Extract of	gr. 2	.13	Gm.	gr. 5	.3	Gm.
Stramonium Seed, Extract of	gr. 1	.06	Gm.	gr. 3	.2	Gm.
Strychnine and its salts	gr. 1/12	.005	Gm.	gr. ¼	.016	Gm.
Tartar Emetic	gr. 2	.13	Gm.			
Veratrum Viride, Fluid Extract of	♏iij	.2	Cc.	♏x	.6	Cc.
Veratrum Viride, Tincture of	♏v	.3	Cc.	♏xij	.8	Cc.

DOSES OF RARE AND UNOFFICIAL DRUGS, SOME NOT TREATED OF IN THIS WORK.

Abrastol, gr. 15-30	1–2 Gm.
Acetal, ʒj–2	4–8 Cc.
Acet-ortho-toluide, gr. 2–5	.13–.3 Gm.
Acet-para-toluide, gr. 15–30	1–2 Gm.
Acetyl-amido antipyrine, gr. 10–30.	.6–2 Gm.
Acid anticylic, gr. 1/100	.0006 Gm.
Acid cathartinic, gr. 3–6	.2–.4 Gm.
Acid cubebic, gr. 5–10	.3–.6 Gm.
Acid fluoric dil., ♏x–20	.6–1.3 Cc.
Acid hydriodic dil., ʒj	4 Cc.
Acid hydrocinnamic, gr. 1–2.	.06–.13 Gm.
Acid ortho-amido salicylic, gr. 2–5.	.13–.3 Gm.
Acid osmic, gr. 1/64	.001 Gm.
Acid picric, gr. 1–5	.06–.3 Gm.
Acid polygalic, gr. ¼–1	.016–.06 Gm.
Adonin (adonidin), gr. 1/16–⅓.	.004–.02 Gm.
Agaricin, gr. ½–2	.03–.13 Gm.
Agathin, gr. 5–10	.3–.6 Gm.
Alantol, gr. ⅙	.01 Gm.
Ammonium embelicum, gr. 2–6.	.13–.4 Gm.
Ammonium picrate, gr. ¼–½.	.016–.03 Gm.
Ammonium salicylate, gr. 5–20.	.3–1.3 Gm.
Ammonol, gr. 5–20	.3–1.3 Gm.
Amyl valerianate, gr. 2–3	.13–.2 Gm.
Amylum iodatum, gr. 5–30	.3–2 Gm.
Antikamnia, gr. 5–10	.3–.6 Gm.
Antinervin, gr. 5–8	.3–.5 Gm.
Antirheumatin, gr. 1–1½	.06–.1 Gm.
Antispasmin, gr. ⅙–1½	.01–.1 Gm.
Antitetraizin, gr. 3–4	.2–.26 Gm.
Antithermin, gr. 3	.2 Gm.
Antitoxin, ʒj–2	4–8 Cc.
Apocodeine hydrochlorate, gr. 1–1¼.	.06–.09 Gm.
Aralia hispida, gr. 20–40	1.3–2.6 Gm.
Aralia racemosa, gr. 20–40	1.6–2.6 Gm.
Arbutin, gr. 3–5	.2–.3 Gm.
Arecoline, gr. 1/20–1/15	.003–.004 Gm.
Asparagin, gr. ½–1½	.03–.1 Gm.
Aspidospermine, gr. 1–2	.06–.13 Gm.
Benzacetine, gr. 5-15	.3–1 Gm.
Benzosol, gr. 4–8	.26–.5 Gm.
Berberine, gr. ½–1	.03–.06 Gm.
Betol, gr. 5–8	.3–.5 Gm.
Bismuth albuminate, gr. 8–15	.5–1 Gm.
Bismuth benzoate, gr. 5–10	.3–.6 Gm.
Bismuth cerium salicylate, gr. 15–30.	1–2 Gm.
Bismuth naphtholate, gr. 15–30.	1–2 Gm.
Bismuth salicylate, gr. 5-30	.3-2 Gm.

Bismuth sulphite, gr. 5–15 ...... .3–1 Gm.
Bismuth valerianate, gr. 1–3.. .06–.2 Gm.
Boldin, gr. 1.......................... .06 Gm.
Bromal hydrate, gr. 1–15 ...... .06–1 Gm.
Bromalin, gr. 30–60................ 2–4 Gm.
Bromamide, gr. 5–10.............. .3–.6 Gm.
Buxine, gr. 15–30.................. 1–2 Gm.
Boldoa fragrans, gr. 15–30. ...... 1–2 Gm.
Cactus grandiflorus, gr. 5–15.... .3–1 Gm.
Cæsium bitartrate, gr. 2–5...... .13–.3 Gm.
Caffeine chloral, gr. 3–5......... .2–.3 Gm.
Caffeine tri-iodide, gr. 2–4... .13–.26 Gm.
Calcium benzoate, gr. 10............ .6 Gm.
Calcium borate, gr. 3–6 .... .2–.4 Gm.
Calcium salicylate, gr. 8–24... .5–1.5 Gm.
Camphor salicylate, gr. 1–4.. .06–.26 Gm.
Cannabinon, gr. $\frac{1}{2}$–$1\frac{1}{2}$........... .03–.1 Gm.
Carniferrin, gr. 3–5............... .2–.3 Gm.
Carpaine, gr. $\frac{1}{10}$–$\frac{1}{6}$............ .006–.01 Gm.
Cetrarin, gr. 1–3.................. .06–.2 Gm.
Cerium nitrate, gr. 1–2........ .06–.13 Gm.
Chionanthus virginica, ʒss–1..... 2–4 Gm.
Chinoline salicylate, gr. 5–15... .3–1 Gm.
Chinoline tartrate, gr. 5–15 ..... .3–1 Gm.
Chloral ammonium, gr. 15–30... 1–2 Gm.
Chlorphenol, ♏xv–30............... 1–2 Cc.
Cocaine borate, gr. $\frac{1}{8}$–2...... .008–.13 Gm.
Cocaine lactate, gr. $\frac{1}{8}$–2...... .008–.13 Gm.
Cocaine nitrate, gr. $\frac{1}{8}$–2...... .008–.13 Gm.
Cocaine saccharate, gr. $\frac{1}{8}$–2.. .008–.13 Gm.
Codeine phosphate, gr. $\frac{1}{2}$–2... .03–.13 Gm.
Convolvulin, gr. 1–2.......... .06–.13 Gm.
Cornutine, gr. $\frac{1}{20}$–$\frac{1}{6}$.......... .003–.01 Gm.
Coronillin, gr. 1–2............. .06–.13 Gm.
Cystine, gr. $\frac{1}{20}$–$\frac{1}{12}$.......... .003–.005 Gm.
Cytisine nitrate, gr. $\frac{1}{20}$–$\frac{1}{12}$.. .003–.005 Gm.
Curare, gr. $\frac{1}{10}$–$\frac{1}{3}$................ .006–.02 Gm.
Curarine, gr. $\frac{1}{64}$–$\frac{1}{32}$......... .001–.002 Gm.
Corydalis, gr. 10–30............... .6–2 Gm.
Creosote carbonate, ♏iij–15...... .2–1 Cc.
Damiana, gr. 30–120............... 2–8 Gm.
Dioscorea, gr. 10–30............... .6–2 Gm.
Dita bark, gr. $\frac{1}{2}$–3 .... .03–.2 Gm.
Drosera, gr. 5–10.................. .3–.6 Gm.
Erythrophleine, gr. $\frac{1}{32}$–$\frac{1}{16}$... .002–.004 Gm.
Ethoxy caffeine, gr. 3 .... .2 Gm.
Eucalypteol, gr. 10–20.......... .6–1.3 Gm.
Euphorbia pilulifera, gr. 30–60.. 2–4 Gm.
Ferratin, gr. 3–8.................... .2–.5 Gm.
Ferropyrine, gr. 5–15.............. .3–1 Gm.
Fuchsine, gr. $\frac{1}{2}$–4............... .03–.26 Gm.
Gallo-bromol, gr. 15–120.......... 1–8 Gm.
Gold bromide, $\frac{1}{20}$–$\frac{1}{10}$....... .003–.006 Gm.
Gold chloride, $\frac{1}{20}$–$\frac{1}{10}$. ..... .003–.006 Gm.
Gold monocyanide, $\frac{1}{20}$–$\frac{1}{4}$... .003–.016 Gm.
Gold tricyanide, $\frac{1}{20}$–$\frac{1}{4}$ ..... .003–.016 Gm.
Gurjun balsam, ʒss–2................ 2–8 Cc.
Hæmogallol, gr. 3–5.............. .2–.3 Gm.
Hæmol, gr. 1–8..................... .06–.5 Gm.
Hæmoglobin, gr. 1–3............ .06–.2 Gm.
Helenin, gr. $\frac{1}{6}$.......................... .01 Gm.
Heliotropine, gr. 5–15............ .3–1 Gm.
Homatropine, gr. $\frac{1}{120}$–$\frac{1}{60}$.. .0005–.001 Gm.
Homatropine hydrobromate, gr. $\frac{1}{120}$–$\frac{1}{60}$. .0005–.001 Gm.
Hydracetine, gr. $\frac{1}{2}$–$1\frac{1}{2}$........... .03–.1 Gm.

Hydrangea, gr. 30–60............... 2–4 Gm.
Hydronaphthol, gr. 1–2....... .06–.13 Gm.
Iodo-caffeine, gr. 5...................... .3 Gm.
Iridin (irisin), gr. 1–4......... .06–2.6 Gm.
Iron benzoate, gr. 1–5............ .06–.3 Gm.
Iron dialyzed, ♏v–30.................. .3–2 Cc.
Iron magnetic oxide, gr. 5–10.. .3–.6 Gm.
Iron malate, gr. 5–15.............. .3–1 Gm.
Iron pomate, gr. 5–15............. .3–1 Gm.
Kava-kava, gr. 10–30.............. .6–2 Gm.
Kairin, gr. 2–10................... .13–.6 Gm.
Kosin, gr. 5–30........................ .3–2 Gm.
Lactol, gr. 3–8........................ .2–.5 Gm.
Lantanine, gr. 15–30.............. .1–2 Gm.
Lipanin, ʒj–4........................ 4–15 Cc.
Lithium benzoate, gr. 5–15...... .3–1 Gm.
Lithium formate, gr. 3............... .2 Gm.
Lithium salicylate, gr. 10–30.... .6–2 Gm.
Lithium sulphoichthyolate, gr. 5–8. .3–.5 Gm.
Lysidine, gr. 15–60.................. 1–4 Gm.
Magnesium lactate, gr. 15–45.... 1–3 Gm.
Magnesium phenolsulphonate, gr. 15–30. 1–2 Gm.
Magnesium salicylate, gr. 15–30.. 1–2 Gm.
Malakin, gr. 10–15....... .... .6–1 Gm.
Malt extract, ʒj–2..................... 4–8 Cc.
Mercuric naphtolate, gr. 1......... .06 Gm.
Mercuric peptonate, gr. $\frac{1}{6}$.......... .01 Gm.
Mercuric salicylate, gr. $\frac{1}{64}$–$\frac{1}{8}$. .001–.008 Gm.
Mercuric thymol-acetate, gr. $\frac{1}{12}$–$\frac{1}{6}$. .005–.01 Gm.
Mercuric thymolate, gr. $\frac{1}{12}$–$\frac{1}{6}$. .005–.01 Gm.
Mercurous acetate, gr. $\frac{1}{6}$–1.... .01–.06 Gm.
Mercurous tannate, gr. 1–2.... .06–.13 Gm.
Mercury amido-propionate, gr. $\frac{1}{12}$–$\frac{1}{6}$. .005–.01 Gm.
Mercury carbolate, gr. $\frac{1}{4}$–$\frac{1}{2}$.... .016–.03 Gm.
Mercury formamidate (1 p. c. sol.), ♏v–15.................................... .3–1 Cc.
Mercury imido-succinate, gr. $\frac{1}{12}$–$\frac{1}{6}$. .005–.01 Gm.
Mercury sozo-iodolate, gr. 1....... .06 Gm.
Methylene blue, gr. 2–8........ .13–.5 Gm.
Methoxy caffeine, gr. 2–4..... .13–.26 Gm.
Migranin, gr. 10–15................ .6–1 Gm.
Morphine benzoate, gr. $\frac{1}{6}$–$\frac{1}{4}$. .01–.016 Gm.
Morrhuol, gr. 1–5 .... .06–.3 Gm.
Myrtol, ♏v.. .3 Cc.
Naphtol, gr. 5–15..................... .3–1 Gm.
Narceine hydrochlorate, gr. $\frac{1}{6}$–1. .01–.06 Gm.
Narcotine, gr. 3–10................. .2–.6 Gm.
Neurodine, gr. 10–20............ .6–1.3 Gm.
Oleo-creosote, ♏v–15................ .3–1 Cc.
Orexine, gr. 2–6.................... .13–.4 Gm.
Orthine, gr. 3–8...................... .2–.5 Gm.
Ouabain, gr. $\frac{1}{1000}$................. .00006 Gm.
Oxy-sparteine, gr. $\frac{1}{2}$–$1\frac{1}{2}$......... .03–.1 Gm.
Papain, gr. 2–5...................... .13–.3 Gm.
Papayotin, gr. 2–5................ .13–.3 Gm.
Paracresalol, gr. 3–30............. .2–2 Gm.
Phenidin, gr. 5–15.................. .3–1 Gm.

Phenylester of anisic acid, gr. 8–15. .5–1 Gm.
Phloridzin, gr. 5–10.............. .3–.6 Gm.
Phytolaccin, gr. 2-3............ .13–.2 Gm.
Piliganine hydrochlorate, gr. 1/6–1/3. .01–.02 Gm.
Potassium cobalto-nitrite, gr. 1/2.....03 Gm.
Potassium osmate, gr. 1/64......... .001 Gm.
Propylamine, gr. 30–60........... 2–4 Gm.
Pyoktanin, gr. 1–5......... ... .06–.3 Gm.
Pyrazol, gr. 15–30.................. 1-2 Gm.
Pyridine, ♏j-3...................... .06–.2 Cc.
Quinine arsenite, gr. 1/12–1/2... .005–.03 Gm.
Quinine salicylate, gr. 1–8.... .06–.5 Gm.
Quinine tannate, gr. 3–8......... .2–.5 Gm.
Retinol, gr. 1......................... .06 Gm.
Rubidium ammonium bromide, gr. 15–20. 1–1.3 Gm.
Rubidium iodide, gr. 1–2.... .06–.13 Gm.
Salicylamide, gr. 2–5........... .13–.3 Gm.
Santoninoxime, gr. 1–2....... .06–.13 Gm.
Scillain, gr. 1/6–3/4................ .01–.05 Gm.
Scillipicrin, gr. 1/60.................. .001 Gm.
Sodium anisate, gr. 10-15........ .6–1 Gm.
Sodium di-thio-salicylate, gr. 3... .2 Gm.
Sodium para-cresotate, gr. 30–90 2-6 Gm.
Sodium sulfo-caffeate, gr. 15........ 1 Gm.
Solanine, gr. 1/6–1................ .01–.06 Gm.
Somatose, ʒss–8.................. . 2–30 Gm.
Sulphaminol, gr. 2–4.......... .13–.26 Gm.
Tartar-lithine, gr. 5–10.......... .3–.6 Gm.
Tartar-lithine and sulphur, gr. 5–10. .3–.6 Gm.
Terpinol, gr. 5–15.................. .3–1 Gm.
Thalline tartrate, gr. 2–8...... .13–.5 Gm.
Thermifugin, gr. 1–4.......... .06–.26 Gm.
Thermodin, gr. 5–15............... .3–1 Gm.
Thiol, gr. 2–10..................... .13–.6 Gm.
Thymacetin, gr. 3–10 .... .2–.6 Gm.
Tolypyrine, gr. 8-30 ....5–2 Gm.
Tolysal, gr. 15–30.................... 1–2 Gm.
Tussol, gr. 2–8 .... .13–.5 Gm.
Uropherin, gr. 10–15 .... .6–1 Gm.
Vieirin, gr. 1–3...................... .06–.2 Gm.

TABLE SHOWING THE NUMBER OF DROPS IN A FLUIDRACHM OF VARIOUS LIQUIDS, WITH THE WEIGHT OF ONE FLUIDRACHM OF EACH IN GRAINS AND IN GRAMMES.

	Drops in fʒj. (60 m.)	Weight of fʒj	
		in grain.	in gram.
Acetum opii	90	61	3.95
Acetum sanguinariæ	78	55½	3.59
Acetum scillæ	68	57	3.69
Acidum aceticum	108	58	3.75
Acidum aceticum dilutum	68	55	3.56
Acidum carbolicum	111	59	3.82
Acidum hydrochloricum	70	65	4.21
Acidum hydrochloricum dilutum	60	56	3.62
Acidum hydrocyanicum dilutum	45	54	3.49
Acidum lacticum	111	66	4.27
Acidum nitricum	102	77	4.98
Acidum nitricum dilutum	60	58	3.62
Acidum nitrohydrochloricum	76	66	4.27
Acidum phosphoricum dilutum	59	57	3.69
Acidum sulphuricum	128	101	6.54
Acidum sulphuricum aromaticum	146	53	3.43
Acidum sulphuricum dilutum	60	58½	3.79
Acidum sulphurosum	59	55	3.56
Æther fortior	176	39	2.52
Alcohol	146	44	2.85
Alcohol dilutum	137	49	3.17
Aqua	60	55	3.56
Aqua ammoniæ fortior	66	50	3.24
Balsamum peruvianum	101	60	3.88
Bromum	250	165	10.69
Chloroformum purificatum	250	80	5.18
Copaiba	110	51	3.30
Creosote	122	56½	3.66

	Drops in fʒj. (60 m.)	Weight of fʒj	
		in grain.	in gram.
Extractum belladonnæ fluidum	156	57	3.69
Extractum buchu fluidum	150	47½	3.07
Extractum cinchonæ fluidum	138	58	3.75
Extractum colchici radicis fluidum	160	57	3.69
Extractum colchici seminis fluidum	158	55	3.56
Extractum conii fructus fluidum	137	61	3.93
Extractum digitalis fluidum	134	62	4.01
Extractum ergotæ fluidum	133	60	3.88
Extractum gelsemii fluidum	149	49	3.14
Extractum glycyrrhizæ fluidum	133	61	3.95
Extractum hyoscyami fluidum	160	59	3.82
Extractum ipecacuanhæ fluidum	120	60	3.88
Extractum pareiræ fluidum	140	57	3.72
Extractum rhei fluidum	158	61	3.95
Extractum sarsaparillæ compositum fluidum	134	60	3.88
Extractum senegæ fluidum	137	62	4.01
Extractum serpentariæ fluidum	148	47	3.07
Extractum uvæ-ursi fluidum	137	60	3.88
Extractum valerianæ fluidum	150	49	3.17
Extractum veratri viridis fluidum	150	50	3.24
Extractum zingiberis fluidum	142	48	3.11
Glycerinum	67	68	4.40
Hydrargyrum	150	760	49.24
Liquor acidi arsenosi	57	55	3.56
Liquor ammonii acetatis	75	56	3.62
Liquor arseni et hydrargyri iodidi	58	55	3.56
Liquor ferri chloridi	71	72	4.66
Liquor ferri citratis	71	72	4.66
Liquor ferri nitratis	59	59	3.82
Liquor ferri subsulphatis	73	83	5.37
Liquor ferri tersulphatis	83	72	4.66
Liquor hydrargyri nitratis	131	123	7.97
Liquor iodi compositus	63	59	3.82
Liquor plumbi subacetatis	74	70	4.53
Liquor potassæ	62	58	3.75
Liquor potassii arsenitis	57	55	3.56
Liquor sodæ chloratæ	63	62	4.01
Liquor zinci chloridi	89	88	5.70
Oleoresina aspidii	130	52	3.36
Oleoresina capsici	120	51	3.30
Oleoresina cubebæ	123	52	3.36
Oleum æthereum	125	50	3.24
Oleum amygdalæ amaræ	115	55	3.56
Oleum amygdalæ expressum	108	48½	3.14
Oleum anisi	119	54	3.49
Oleum aurantii corticis	120	54	3.49
Oleum bergamottæ	130	46	2.98
Oleum cari	132	50	3.24
Oleum caryophylli	130	57	3.69
Oleum chenopodii	97	50	3.24
Oleum cinnamomi	126	53½	3.46
Oleum copaibæ	123	49½	3.20
Oleum cubebæ	125	51	3.30
Oleum fœniculi	125	53	3.43

	Drops in fʒj. (60 m.)	Weight of fʒj	
		in grain.	in gram.
Oleum gaultheriæ	125	62	4.01
Oleum juniperi	148	49	3.17
Oleum lavandulæ florum	138	52	3.36
Oleum limonis	129	47	3.04
Oleum menthæ piperitæ	129	50	3.24
Oleum olivæ	76	51	3.33
Oleum ricini	77	51½	3.33
Oleum rosæ	132	47	3.04
Oleum rosmarini	143	50	3.24
Oleum sabinæ	102	54	3.49
Oleum sassafras	133	58	3.75
Oleum terebinthinæ	136	45½	2.94
Oleum tiglii	104	50	3.24
Spiritus ætheris compositus	148	45	2.91
Spiritus ætheris nitrosi	146	47	3.04
Spiritus ammoniæ aromaticus	142	48	3.11
Spiritus camphoræ	143	47	3.04
Spiritus chloroformi	150	48	3.11
Spiritus menthæ piperitæ	142	47	3.04
Syrupus acaciæ	44	73	4.73
Syrupus ferri iodidi	65	77	4.98
Syrupus scillæ	75	74	4.79
Syrupus scillæ compositus	102	70	4.53
Syrupus senegæ	106	70	4.53
Syrupus simplex	65	72	4.66
Tinctura aconiti	146	46	2.98
Tinctura asafœtidæ	120	54	3.49
Tinctura belladonnæ foliorum	137	53	3.43
Tinctura benzoini composita	148	48	3.11
Tinctura cantharidis	131	51	3.33
Tinctura cinchonæ composita	140	49	3.17
Tinctura digitalis	128	53	3.43
Tinctura ferri chloridi	150	53	3.43
Tinctura guaiaci	130	46	2.98
Tinctura iodi	148	47	3.04
Tinctura nucis vomicæ	140	44	2.85
Tinctura opii	130	53	3.43
Tinctura opii camphorata	130	52	3.36
Tinctura opii deodorata	110	54	3.49
Tinctura tolutana	130	46	2.98
Tinctura valerianæ	130	52	2.36
Tinctura veratri viridis	145	46	2.98
Tinctura zingiberis	144	46	2.98
Vinum antimonii	72	50	3.24
Vinum colchici radicis	107	55	3.56
Vinum colchici seminis	111	54	3.49
Vinum opii	100	55	3.56

TABLE OF THERMOMETRIC EQUIVALENTS.

(Fahrenheit and Centigrade Scales.)

F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.
212	100	174	79	136	58	99	37	61	16	23	—5
210	99	172	78	135	57	97	36	59	15	21	—6
208	98	171	77	133	56	95	35	57	14	19	—7
207	97	169	76	131	55	93	34	55	13	18	—8
205	96	167	75	129	54	91	33	54	12	16	—9
203	95	165	74	127	53	90	32	52	11	14	—10
201	94	163	73	126	52	88	31	50	10	12	—11
199	93	162	72	124	51	86	30	48	9	10	—12
198	92	160	71	122	50	84	29	46	8	9	—13
196	91	158	70	120	49	82	28	45	7	7	—14
194	90	156	69	118	48	81	27	43	6	5	—15
192	89	154	68	117	47	79	26	41	5	3	—16
190	88	153	67	115	46	77	25	39	4	1	—17
189	87	151	66	113	45	75	24	37	3	—1	—18
187	86	149	65	111	44	73	23	36	2	—2	—19
185	85	147	64	109	43	72	22	34	1	—4	—20
183	84	145	63	108	42	70	21	32	0	—11	—24
181	83	144	62	107	41	68	20	30	—1	—31	—35
180	82	142	61	104	40	66	19	28	—2	—35	—37
178	81	140	60	102	39	64	18	27	—3	—40	—40
176	80	138	59	100	38	63	17	25	—4		

To convert Fahrenheit to Centigrade, subtract 32, multiply by 5, and divide by 9.
To convert Centigrade to Fahrenheit, multiply by 9, divide by 5, and add 32.

POPULAR MEDICAL ABBREVIATIONS.

āā.	Ana	Of each.
Abs. febr.	Absente febre	Fever being absent.
Ad.	Adde	Add up to.
Ad 2 vic.	Ad duas vices	At two doses.
Ad sec. vic.	Ad secundum vicem	For twice.
Ad ter vic.	Ad tertiam vicem	For thrice.
Ad lib.	Ad libitum	At pleasure.
Ad us.	Ad usum	According to custom.
Adst. febre	Adstante febre	Fever present.
Aeq.	Æquales	Equal.
Alt. hor.	Alternis horis	Every other hour.
Agit. vas.	Agitato vase	Shaking the vial.
Aliq.	Aliquot	Some, a few.
Alv. adst.	Alvo adstricta.	Bowels confined.
Ampul.	Ampulla	A large bottle.
Aq.	Aqua	Water.
Aq. astr.	Aqua astricta	Frozen water.
Aq. bull.	Aqua bulliens.	Boiling water.
Aq. comm.	Aqua communis	Common water.
Aq. ferv.	Aqua fervens	Hot water.
Aq. fluv.	Aqua fluvialis (fluviatilis)	River water.
Aq. font.	Aqua fontalis (fontana)	Spring water.
Aq. lac.	Aqua lacalis	Lake water.
Aq. mar.	Aqua marina	Sea water.
Aq. niv.	Aqua nivalis	Snow water.
Aq. pluv.	Aqua pluvialis(pluviatilis)	Rain water.
Aut	Aut.	Or.

Bals.	Balsamum	Balsam.
Bib.	Bibe	Drink.
Bid.	Biduum	Two days.
Bis	Bis.	Twice.
Bis in d.	Bis in die (indies)	Twice daily.
Bis in 7 d.	Bis in septem diebus	Twice a week.
Bol.	Bolus	A large pill.
Bull.	Bulliat (bulliant)	Let boil.
But.	Butyrum	Butter.
C.	Cum	With.
C. m.	Cras mane	To-morrow morning.
C. m. s.	Cras mane sumendus	Take to-morrow morning.
C. n.	Cras nocte	To-morrow night.
C. v.	Cras vespere	To-morrow evening.
Cærul.	Cæruleus	Blue.
Cal.	Calomelas	Calomel.
Cap.	Capiat (Cape)	Let him (her) take.
Cap.	Capsula	A capsule.
Caute	Caute	Cautiously.
Chart.	Charta	Paper.
Chartul.	Chartula	Small paper.
Cib.	Cibus	Food.
Col.	Cola	Strain.
Coch.	Cochleare	A spoonful.
Coch. ampl.	Cochleare amplum	A tablespoonful.
Coch. infant.	Cochleare infantis	A teasponful.
Coch. mag.	Cochleare magnum.	A tablespoonful.
Coch. mod.	Cochleare modicum.	A dessertspoonful.
Coch. parv.	Cochleare parvum	A teaspoonful.
Coct.	Coctio	Boiling.
Colatur.	Colaturæ	To the stained liquor.
Collut.	Collutorium	A mouth wash.
Collyr., coll	Collyrium	An eye-wash.
Comp.	Compositus	Compound, compounded.
Con., concis.	Concisus	Cut.
Conf.	Confectio	Confection.
Contin.	Continueter	Let it be continued.
Cont. rem.	Continuantur remedia	Let medicines be continued.
Cuj.	Cujus	Of which.
Coq.	Coque, coquantur	Boil.
Cort.	Cortex	The bark.
Crast., cras.	Crastinus	To-morrow.
Crast.	Crastinus (cras)	Early to-morrow.
Cyath.	Cyathus	A glassful.
Cyatho theæ	Cyatho theæ	In a cup of tea.
Cyath. (c.) vinar.	Cyathus vinarius	A wineglassful.
D.	Dosis	A dose.
De d. in d.	De die in diem	From day to day.
D., det.	Da, detur	Give ; let it be given.
De	De	Of or from.
Deaur. pil.	Deaurentur pilulæ	Let the pills be gilded.
Deb. spiss.	Debita spissitudo	A proper consistence.
Dec.	Decanta	Pour off.
Decem.	Decimus	Ten, the tenth.
Dococt.	Decoctum	A decoction.

Deglut.	Deglutiatur	Let it be swallowed.
D. t. d. No. 4.	Dentur tales doses No. 4.	Take four such doses.
Dieb. alt.	Diebus alternis	On alternate days.
Dieb. tert.	Diebus tertiis	Every third day.
Dil.	Dilue, dilutus	Dilute, diluted.
Dim.	Dimidius	One-half.
Disp.	Dispensa, dispensetur	Dispense, let it be dispensed.
D. D. or direc. prop.	Directione propriâ	With proper direction.
D. in p. æq.	Dividatur in partes æquales	Divide in equal parts.
Div., divid.	Dividendus	Divide, to be divided.
Don.	Donec	Until.
Dur. dolor.	Durante dolore	During the pain.
Ead.	Eadem	The same.
Elect.	Electuarium	An electuary.
En., enem.	Enema (enemata)	An enema, a clyster.
Et	Et	And.
Exhib.	Exhibeatur	Let it be exhibited.
Ext.	Extende (extendatur)	Spread.
Extr.	Extractum	An extract.
F., Ft.	Fac, fiat, fiant	Make, let it be made.
F. ft. pil. 12	Fac pilulas duodecim	Make 12 pills.
Far.	Farina	Flour.
Feb. dur.	Febre durante	During the fever.
Ferv.	Fervens	Boiling.
F. (Ft.) cataplasm	Fiat cataplasma	Make a poultice.
Ft. cerat.	Fiat ceratum	Make a cerate.
Ft. chart. 12	Fiant chartulæ duodecim	Make 12 powders.
Ft. collyr.	Fiat collyrium	Make an eye-wash.
Ft. confec.	Fiat confectio	Make a confection.
Ft. elect.	Fiat electuarium	Make an electuary.
Ft. emp. 3 x 6	Fiat emplastrum 3 x 6	Make a plaster 3 x 6 inches.
Ft. emuls.	Fiat emulsio	Make an emulsion.
Ft. garg.	Fiat gargarisma	Make a gargle.
Ft. h. (haust.)	Fiat haustus	Make a draught.
Ft. infus.	Fiat infusum	Make an infusion.
Ft. inject.	Fiat injectio	Make an injection.
Ft. m. (mist.)	Fiat mistura	Make a mixture.
Ft. pil.	Fiat pilula	Make a pill.
F. L. A.	Fiat lege artis	Make by rules of art.
Ft. linim.	Fiat linimentum	Make a liniment.
Ft. (mas.) massa.	Fiat massa	Make a mass.
Ft. mas. div. in pil. 12	Fiat massa in pilulas duodecim dividenda	Make 12 pills.
Ft. pulv.	Fiat pulvis	Make a powder.
Ft. pulv. et div. in chart. 12		Make 12 powders.
Ft. solut.	Fiat solutio	Make a solution.
Ft. suppos. 4	Fiant suppositora quatuor	Make 4 suppositories.
Ft. troch. 12	Fiat trochisci duodecim	Make 12 lozenges.
Ft. ung.	Fiat unguentum	Make an ointment.
Filtra.	Filtram	Filter (thou), a filter.
Fl.	Fluidus	Liquid.
Form.	Formula	A prescription.
Garg.	Gargarisma	A gargle.

Gr.	Granum, Grana	Grain, grains.
Grat.	Gratus	Pleasant.
Gtt.	Gutta, guttæ	A drop, drops.
Guttat.	Guttatim.	By drops.
Habt.	Habeat	Let him have.
Haust.	Haustus	A draught.
H.	Hora	An hour.
H. s. (hor. som.)	Hora somni	Before going to sleep.
H. d.	Hora decubitus	Hour of retiring.
Hor. interm.	Horis intermediis	At intermediate hours.
Ind.	In dies (indies)	Daily.
Inf.	Infunde	Pour in.
Infus.	Infusum	An infusion.
Injec.	Injectio	An injection.
Int.	Internus	Inner, internal.
Jent.	Jentaculum	Breakfast.
Jux.	Juxta (juxtim)	Near to.
Kali ppt.	Kali præparatum	Prepared kali $=K_2CO_3$.
Lac.	Lactis	Milk.
Lat. dol.	Lateri dolenti	To the painful side.
Lin.	Linimentum	A liniment.
Liq.	Liquor	A solution.
Lot.	Lotio	A lotion.
Mac.	Macera	Macerate.
Mag.	Magnus	Large.
M., man.	Manipulus	A handful.
Manus	Manus	The hand.
Mas., mass	Massa (pilularis)	A mass—a pill mass.
Mensur., mens.	Mensura	By measure.
Mic. pan.	Mica panis	Crumb of bread.
M., min.	Minimum	A minim.
Minut.	Minutum	A minute.
M.	Misce	Mix.
Mist.	Mistura	A mixture.
Mitte.	Mittatur	Send, let it be sent.
Mit. tal.	Mitte talis	Send of such like.
Mod. præsc.	Modo præscripto	In manner prescribed.
More dict.	More dictu	In manner directed.
Non	Non	Not.
Non repetat.	Non repetatur.	Let it not be repeated.
No.	Numerus (numero)	Number.
N. a.		Numerical aperture.
N. F.		National Formulary.
O.	Octarius	A pint.
Omn. hor.	Omni hora	Every hour.
O. m.	Omni mane	Every morning.
Omn. bih.	Omni bihora	Every two hours.
O. n.	Omni nocti	Every night.
P. æ.	Partes æquales	Equal parts.
Part. vic.	Partitis vicibus	In divided doses.
P., pt.	Perstetur	Continue.
Penicil. cam.	Penicillum camelinum	Camel's-hair pencil.
Pas., pastil.	Pastillum, pastillus	A small lozenge.
P. P. A.	Phiala prius agitata	First shaking the bottle.
Pil.	Pilula	A pill.
Pocul., pocill., poc.	Poculum, pocillnm	A cup, a little cup.

P.	Pondere	By weight.
Pone aur.	Pone aurem	Behind the ear.
Pot.	Potus	Drink.
Præp.	Præparat(us)-a	Prepared.
Prand.	Prandium	Dinner.
Prim. man.	Primo mane	Early in the morning.
Pro rat. æt.	Pro ratione ætatis	According to the age of the patient.
P. r. n.	Pro re nata	When necessary.
Pug.	Pugillus	A pinch.
Pulv.	Pulvis, pulverizatus	A powder, powdered.
Pyx.	Pyxis	A pill box.
Q. l.	Quantum libet	As much as is required.
Q. p.	Quantum placet	As much as is required.
Q. v.	Quantum vis, volueris	As much as is required.
Q. s.	Quantum sufficit	A sufficient quantity.
Qq. hor.	Quaqua hora	Each, every hour.
Q. q.	Quoque, quaque	Also—each, every.
Rec.	Recens	Fresh.
℞.	Recipe	Take.
Rept.	Repetatur	Let it be repeated.
Scat.	Scatula	A box.
S. a.	Secundum artem	According to art.
S. n.	Secundum naturam	According to nature.
Ss.	Semis	A half.
Semih.	Semihora	Half an hour.
Sesqh.	Sesquihora	A hour and a half.
Sig.	Signa	Mark thou, sign.
Sing.	Singulorum	Of each.
Si n. val.	Si non valeat	If it does not answer.
Si op. sit	Si opus sit	If necessary.
Solv.	Solve, solvetur	Dissolve.
Stat.	Statim	Immediately.
St.	Stet, stent	Let in stand.
S. s. s.	Stratum superstratum	Layer upon layer.
Sum.	Sume, sumat sumendus	Take, let it be taken.
Summit.	Summitates	The summits, tops.
Sup.	Super, supra	Above.
Tal.	Talis	Such, like this.
T. i. d. or t. d.	Ter (in) die	Three times a day.
Tinct., tr.	Tinctura	Tincture.
Trit.	Tritura	Triturate.
Troch.	Trochisci	Lozenges.
Ter.	Tere	Rub.
Ter. bene	Tere bene	Rub well.
Ult. præsc.	Ultimo præscriptus.	The last ordered.
Una	Una	Together.
Unc.	Uncia	An ounce.
Utend.	Utendum	To be used.
Ut dict.	Ut dictum	As directed.
U. S. P.		United States Pharmacopœia.
Vehic.	Vehiculum	A vehicle.
Vel	Vel	Or.
Vesp.	Vesper, vesperis	The evening.
Vom. urg.	Vomitione urgente	The vomiting being troublesome.

SOME LEADING OFFICIAL ORGANIC DRUGS WHOSE MEDICAL PROPERTIES DEPEND UPON ONE OR MORE SPECIFIC CONSTITUENTS.

1. *Sugar.*

Fig, Honey, Manna, Prune, Triticum.

2. *Sugar + Acid.*

Cassia Fistula, Lemon Juice, Phytolacca Fruit, Raspberry, Tamarind, Rhus Glabra.

3. *Mucilage.*

Althæa, Cetraria, Chondrus, Elm, Sassafras Pith, Acacia, Tragacanth.

4. *Volatile Oil.*

Anise (1–3 p. c.), Buchu (1–1.6 p. c.), Calamus (1–2 p. c.), Caraway (5–7 p. c.), Cardamom (5 p. c.), Cascarilla (1.6 p. c.), Chenopodium (3–3$\frac{1}{2}$ p. c.), Cinnamon ($\frac{1}{2}$–2 p. c.), Cloves (18 p. c.), Coriander ($\frac{1}{2}$–1 p. c.), Cubeb (5–15 p. c.), Eriodictyon, Eucalyptus (6 p. c.), Fennel (2–6 p. c.), Garlic ($\frac{1}{4}$ p. c.), Ginger (1–2 p. c.), Hedeoma (1 p. c.), Illicium (2–5 p. c.), Lemon Peel (2 p. c.), Mace (8 p. c.), Marrubium, Melissa ($\frac{1}{4}$ p. c.), Mustard, Nutmeg (2–8 p. c.), Orange Peel (Bitter), Orange Peel (Sweet), Pepper (1–2 p. c.), Peppermint (1 p. c.), Pimenta (3–4 p. c.), Rose Pale, Rose Red, Saffron (1 p. c.), Salvia ($\frac{1}{2}$–$\frac{3}{4}$ p. c.), Sambucus, Sassafras (5 p. c.), Scutellaria, Spearmint ($\frac{1}{2}$ p. c.), Sumbul ($\frac{1}{3}$ p. c.), Tansy ($\frac{1}{4}$ p. c.), Valerian, Vanilla.

5. *Concrete Volatile Oil.*

Camphor, Menthol, Thymol.

6. *Resin.*

Guaiac, Mastic, Rosin, Aspidium, Cascara Sagrada, Caulophyllum, Cimicifuga, Cotton Root Bark, Frangula, Jalap, Kamala, Podophyllum, Pulsatilla, Pumpkin Seed, Stillingia.

7. *Oleo-resin.*

Copaiba (oil, 20-90 p. c.), Turpentine (oil, 20-30 p. c.), Turpentine Canada (oil, 20–30 p. c.), Burgundy Pitch, Tar.

8. *Gum-resin.*

Gamboge (gum, 16–26 p. c., resin, 66-80 p. c.), Scammony (gum, 3-8 p. c., resin, 75–95 p. c.), India Rubber (resin, 32 p. c.).

9. *Gum, Resin + Volatile Oil.*

Ammoniac (gum, 18-26 p. c., resin 70 p. c., vol. oil, 1–4 p. c.), Asafetida (gum, 20–30 p. c., resin, 50-70 p. c., vol. oil, 3-9 p. c.), Myrrh (gum, 40–60 p. c., resin, 25–40 p. c., vol. oil, 2–4 p. c.).

10. *Balsam.*

Benzoin (benzoic acid, 12-24 p. c.), Balsam of Peru (resin 32 p. c., cinnamein, 60 p. c.), Balsam of Tolu (vol. oil, 1 p. c.), Storax.

11. *Volatile Oil (Resin) + Bitter Principle.*

Absinthium, Arnica, Asclepias, Chamomile, Cypripedium, Grindelia, Hamamelis, Inula, Iris, Lappa, Lupulin, Matico, Matricaria, Mezereum, Phytolacca Root, Pyrethrum, Serpentaria, Xanthoxylum, Cusso, Indian Cannabis.

12. *Fixed Oil +.*

Aspidium, Cotton Root Bark, Flaxseed, Lycopodium, Pumpkin Seed, Pyrethrum, Stillingia, Sweet Almond, Vanilla.

13. *Tannic or Gallic Acid.*

Castanea, Catechu, Geranium, Hæmatoxylon, Kino, Krameria, Nutgall, White Oak, Wild Cherry, Rubus, Rumex.

14. *Glucoside.*

Aloes, Apocynum, Araroba, Bryonia, Calendula, Calumba, Dulcamara, Capsicum, Chimaphila, Chirata, Colocynth, Convallaria, Corn Silk, Digitalis, Ergot, Euonymus, Eupatorium, Glycyrrhiza, Juglans, Leptandra, Quillaja, Rhubarb, Rhus Toxicodendron, Santonica, Sarsaparilla, Senega, Senna, Squill, Strophanthus, Taraxacum, Uva Ursi, Vanilla, Viburnum, Cascarilla, Wild Cherry, Cetraria, Caulophyllum, Cloves, Cubeb, Frangula, Guarana, Kamala, Quassia, Phytolacca.

15. *Alkaloid.*

Aconite, Aspidosperma, Belladonna, Chelidonium, Cinchona, Colchicum, Conium, Coca, Calumba, Gelsemium, Guarana, Hydrastis, Hops, Hyoscyamus, Ipecac, Lobelia, Menispermum, Nux Vomica, Opium, Pareira, Pepper, Physostigma, Pilocarpus, Pomegranate, Sanguinaria, Scoparius, Spigelia, Staphisagria, Stramonium, Tobacco, Veratrum Viride.

INDEX.

ABBÉ condenser, 812, 813
Abbreviations, 840
Aberration, chromatic, 811
  spherical, 812
Abies Abies, balsamea, canadensis, excelsa, Fraseri, Menziesii, pectinata, Picea, 71, 72, 73, 74
Abietic anhydride, 68
Abrus precatorius, 305
Absinthium, absinthin, absinthe, 575
Abstract aconite, 195
  belladonna, 498
  conium, 420
  digitalis, 515
  hyoscyamus, 501
  jalap, 468
  nux vomica, 451
  podophyllum, 203
  senega, 347
  valerian, 544
Abstracts, Abstracta, 21
Absynthol, 574, 575
Abuta amara, rufescens, 208
Abutilon, 381
Acacia Adansonii, anthelmintica, arabica, Catechu, Ehrenbergiana, fistula, gummifera, nilotica, Senegal, Seyal, stenocarpa, Suma, tortilis, vera, Verek, 267, 269, 271, 273, 361
Acetanilid, 768, 791
Acetbromanilid, 791
Acetol salicylate, 798
Acetone, 70, 779
Acetophenone, 796
Acetum, Aceta (vinegars), 19
  lobeliæ, 554
  opii, 184, 230
  sanguinariæ, 236
  scillæ, 99
Acetyl-phenyl-hydrazine, 795
Achillea Millefolium, Ptarmica, 569, 570
Achilleine, 570
Acid abietic, 68, 73
  absinthic, 575
  acetic, 751, 752, 780
  aconitic, 195
  amido-succinamic, 380
  anemonic, 198
  anemoninic, 198
  angelic, 95, 425, 569
  anisic, 799
  anthemic, 569, 571
Acid arabic, 270, 297
  arsenous, 730
  artanthic, 139
  behenic, 239
  benzoic, 293, 295, 438, 797
  boheic, 388
  boric, boracic, 623
  butyric, 63, 427
  caffeo-tannic, 519
  cambogic, 390
  camphoric, 222, 800
  camphoronic, 222
  capronic, 70
  carbolic, 761, 762, 783
  carminic, 586
  carnaubic, 609
  caryophyllic, 401, 790
  caryophyllinic, 401
  catechuic, catechinic, 273
  catechu-tannic, 273
  cathartic, cathartinic, 279
  cephaëlic, 523
  cerotic, 594
  cetraric, 60
  cevadic, 95
  chelidoni(ni)c, 94, 237
  chloracetic, 780
  chromic, 646, 704
  chrysatropic, 496
  chrysophanic, 170, 171, 173
  cincho-tannic, 530, 534
  cinnamic, 102, 220, 293, 295
  citric, 337, 755
  columbic, 210, 211
  conic, 419
  copaivic, 286
  cresylic, 785
  crotonoleic, 351
  cubebic, 134, 135
  digallic, 150
  digitoleic, 513
  di-iodo-salicylic, 797
  ergotic, ergotinic, 56, 57
  eriodictyonic, eriodyctic, 472
  erucic, 239
  ethylene-succinic, 237
  eugenic, 401, 790
  euonic, 369
  ferulic, 423
  filicic, filicinic, 63
  filitannic, 63
  flavaspidic, 63

Acid formic, 67
  frangulic, frangulinic, 373, 374
  fusco-sclerotinic, 57
  gallic, 150, 151
  gelseminic (gelsemic), 445
  gentisic, gentianic, 453
  glycocholic, 610
  guaiacic, guaiaretic, 324
  guaiaconic, 324
  gummic, 270
  hemipinic, 187
  hydrobromic diluted, 633
  hydrochloric, 631
  hydrocyanic diluted, 261, 264, 644, 720
  hypophosphorous, 629
  hypopicrotoxic, 212
  igasuric, 449, 450
  ipecacuanhic, 522, 523
  isobutyric, 569
  isoheptoic, 478
  jecoleic, 597
  jervic, 94, 237
  juglandic, 141
  kino-tannic, 300, 301
  kombic, 458
  kramero-tannic, 289
  lactic, 756, 780
  lactucic, 559
  lichenstearic, 60
  linoleic, 317
  lobelic, 553
  lupamaric, 161
  maizenic, 80
  malic, 237, 496, 497, 504
  mastichic, 368
  meconic, 228, 230
  mendelic, 496
  metacopaivic, 286
  methylcrotonic, 95, 96, 426
  methyl-para-oxy-benzoic, 799
  methyl-protocatechuic, 132
  morrhuic, 597
  myrrhic, 344
  nitric, 618, 619
  nitrohydrochloric, 619
  oleic, 752
  ophelic, 455
  ortho-phenol sulphonic, 784
  oxalic, 753
  oxycopaivic, 286
  oxytoluic, 497
  palmitic, 597, 600
  parillic, parillinic, 115
  paullini-tannic, 371
  phenyl-glycolic, 496
  phosphoric, 629
  phytolaccic, 178
  pimaric, 73
  pinic, 67
  podophyllinic, 202
  polygalic, 347, 791
  proprionic, 70
  protocatechuic, 180, 249, 273, 344, 401, 424, 427
  punico-tannic, 396

Acid pyrocatechuic, 300
  pyrogallic, 152
  pyroligneous, 752
  querci-tannic, 148
  quillaic, 254
  quinic (kinic), 530, 534
  quinovic (kinovic), 530, 534
  ratanhia-tannic, 289
  rheic, 170
  rheo-tannic, 170, 171
  rheumic, 170
  ricinelaidic, 354
  ricinoleic, ricinic, 354, 356
  salicylic, 143, 432, 797
  salicylous, 143
  salicyluric, 143
  santalic, 298
  santonic, santoninic, 577
  sclerotic, sclerotinic, 56, 57, 58
  shikimic, 180
  sinapic, 240
  sozoidolic, 784
  sozolic, 784
  sphacelic, 56, 57
  stearic, 753
  succinic, 67, 496, 575
  sulphuric, 625
    aromatic, 626
  sulphurous, 626
  sumbulic, 425, 426
  sylvic, 67, 73
  tannic (gallo-tannic), 150, 249, 313, 400
  tartaric, 377, 754
  taurocholic, 510
  theropic, 597
  tiglic, 569
  tiglinic, 351
  toxicodendric, 365, 366
  tri-chlor-acetic, 780
  valerianic, 540, 541, 544
  veratric, 95
  viburnic, 540, 541
Acipenser Guldenstädtii, Huso, ruthenus, stellatus, sturio, 594, 595
Aconine, 194
Aconite, 193
  Chinese, India, Japanese, 196
Aconitine, 194, 195
Aconitum Anthora, Cammarum (variegatum), columbianum, ferox, Fischeri, heterophyllum, japonicum, luridum, Lycoctonum, Napellus, neomontanum, paniculatum, Störckianum, uncinatum, 193, 196, 197
Acoretin, acorin, 90, 91
Acorn cups, 153
Acorus Calamus, 89
Acrid anemone camphor, 198
Acrinyl sulphocyanide, 239
Actæa racemosa, spicata, 190
Adeps, benzoatus, lanæ, lanæ hydrosus, 438, 601, 602, 608, 609
Adiantum pedatum, 64
Adonidin, adonin, 189
Adonis vernalis, 189

Adraganthin, 297
Ægle Marmelos, 338
Ænas afer, 592
Æsculin, 445
Æther, ether, 757
  acetic, 759
Æthiops cretaceus, 722
Æthusa Cynapium, 421
Agar-agar, 54, 596
Agaric of the oak, agaric, 59
Agaricin, 59
Agaricus muscarius, 59
Agathin, 796
Agathis loranthifolia (Dammara), 74
Agents acting on circulatory system, 37
    cutaneous system, 40
    digestive system, 37
    excretory system, 38
    nervous system, 35
    reproductive system, 40
    respiratory system, 36
  employed in poison cases, 828
  promoting constructive metabolism, 33
    destruction of microbes, 34
    destructive metabolism, 34
Agropyron repens, 85
Airol, 788
Alantol, alanto-lactone, 565
Albane, 436
Albaspidin, 63
Albizzia anthelmintica, 361
Albumin ovi, 599
Alcohol (ethyl), 740, 741, 776
  amylic, 743
  methyl, 70, 776
Aldehydes, 745, 776, 796
Aletris farinosa, 129
Algæ, 44, 51
Alhagi camelorum, 444
Alizarin yellow, 796
Alkalies, 34
Alkermes, 587
Allium Cepa, Porrum, sativum, 97, 98
Allspice, 401
Allyl-isosulphocyanate, 240
Allyl-propyl disulphide, 97
Allyl-sulphocyanide, 240
Allyl-thio(sulpho)-urea, 782
Almond, bitter, sweet, 263, 265
Aloe africana, arborescens, barbadensis, ferox, Perryi, plicatilis, socotrina, spicata, vera, vulgaris, 100, 106
Aloes, Barbadoes, Bonaire, Caballine, Cape, Curaçao, Hepatic, Jafferabad, Moka, Natal, Purified, Socotrine, 101, 102, 106, 107
Aloin, 101
Aloresino-tannol, 102
Alpha-eucaine, 805
Alpinia officinarum, 129
Alteratives, 34
Althæa officinalis, rosea, 379, 381
Althein, 380
Alum, 682
  dried, 683
Aluminum, 682
  and ammonium sulphate, 683
  hydrate, sulphate, 683
Amanita muscaria, 59
Amber, 73
Ambergris, ambra grisea, 601
Aminoform, 777
Ammoniac, 426
  African, 428
Ammonium, benzoate, bromide, carbonate, chloride, iodide, nitrate, phosphate, sulphate, valerianate, 665, 666, 667, 668, 669
  sulpho-ichthyolate, 786, 787
Ammoresino-tannol, 427
Amomum aromaticum, Cardamomum, globosum, Granum paradisi, maximum, verum, xanthoides, 124
Amygdala amara, dulcis, 263, 265
Amygdalin, 261, 263, 264, 316
Amygdalus communis, var. amara, dulcis, Persica, 263, 265, 267
Amylene hydrate, 776
Amyl nitrite, 760
Amylopsin, 603
Amylum iodatum, 78, 79, 80
Amyrin, 345
Anabsinthin, 575
Anacardiaceæ, 48, 364
Anacyclus officinarum, Pyrethrum, 572, 573
Anæsthetics, 36
Analgen, 802
Analgesics, 35
Analgesine, 803
Anamirta Cocculus, paniculata, 211
Anamirtin, 212
Anaphrodisiacs, 40
Andira Araroba, 307
Andropogon Schœnanthus, squarrosa (muricatus), 87, 253
Anemone coronaria, nemorosa, patens, var. Nuttalliana, pratensis, Pulsatilla, quinquefolia, ranunculoides, sylvestris, 197, 198
Anemonin, 198
Anethol, 180, 411, 414
Anethum graveolens, 415
Angelica Archangelica, American, atropurpurea, European, officinalis, purple-stemmed, 412
Angiospermæ, 44, 78
Angustura, false, 326, 327
Anhalonium Lewinii, 392
Anhydrotics, antihydrotics, 39
Aniline, 767
Anise, 413
  star, 179
Annidalin, 786
Anodynes, 35
Anthelmintics, 39
Anthemene, anthemidin, anthemol, 569, 571
Anthemis arvensis, Cotula, nobilis, 568, 569, 570, 571
Anthrarobin, 308, 801

Antidotes to poisons, 827–838
Antiemetics, 38
Antifebrin, 768, 791
Antilithics, 39
Antilles, 288
Antilope Dorcas, 607
Antimony, antimonium (stibium), and potassium tartrate, oxide, sulphide, sulphurated, 731, 732, 733
Antiperiodics, 33
Antiphlogistics, 34
Antipyretics, 33
Antipyrine, salicylate, 803, 804
Antisepsin, asepsin, 791
Antiseptics, 34
Antiseptin, 788
Antispasmodics, 35
Antitoxin, diphtheria, streptococcus, 612
Antizymotics, 34
Aperients, 38
Aphis sinensis, 153
Aphrodisiacs, 40
Apiin, Apiol, 416, 417
Apis mellifica, 592
Apium graveolens, Petroselinum, 416, 417
Apoatropine, 497
Apocynaceæ, 49, 456
Apocynein, apocynin, 457
Apocynum androsæmifolium, cannabinum, 456, 457
Apomorphine hydrochlorate, 229
Apoquinamine, 530
Aporetin, 170, 171
Apple, 267
Aqua, Aquæ, 19
  fortis, regia, 618, 619
Arabin, 270, 297
Arabinose, 270
Araceæ, 44, 89
Arachis hypogæa, 517
Aralia Ginseng, nudicaulis, quinquefolia, spinosa, 407
Araroba, 307
Arbor vitæ, 78
Arbutin, 429, 434
Arctium Lappa, 580
Arctostaphylos glauca, mucrocifera, polifolia, Uva-ursi, 433, 435
Areca, betel nut, 88, 274
  Catechu, 88, 274
Argemone mexicana, 234
Argentum, 718
Arisæma triphyllum, 91
Aristol, 786
Aristolochia reticulata, Serpentaria, var. hastata, 166
Aristolochiaceæ, 46, 165
Aristolochine, 167
Arnica alpina, Chamissonis, foliosa, montana, 120, 578, 580
Arnicin, 579
Aromatics, 38
Arrangement of drugs, 29
  alphabetic sequence, 29
  botanical, 41
  chemical constituents, 29, 30
Arrangement of drugs, morphologic and anatomic, 31, 32
  therapeutic effect, 32–41
Arrow-root—Brazilian, Bermuda, 82, 124
Arsenic, Arsenum, Arsenicum, 729
  antidote, 698
  iodide, 731
Artemisia Abrotanum, Absinthium, abyssinica, gnaphalodes, ludoviciana, maritima, pauciflora, ramosa, Sieberi, vulgaris, 575, 576, 578
Artemisin, 576
Arterial medication, transfusion, 24
Arum triphyllum, 91
Asafetida, 421
Asagræa officinalis, 95
Asaprol, 801
Asaresino-tannol, 423
Asarum canadense, 168
Asclepiadaceæ, 49, 464
Asclepias curassavica, flesh-colored, incarnata, syriaca (Cornuti), tuberosa, 464, 465, 525
Aselline, 597
Aseptol, 784
Ash, European, Manna, 442, 444
Asparagin, 303, 380
Asparamide, 380
Aspidinin, Aspidinol, 63
Aspidium athamanticum, rigidum, 64
Aspidosperma Quebracho-blanco, 460
Aspidospermatine, aspidospermine, aspidosamine, 461
Astacus fluviatilis, 588
Astragalus bæticus, crotalariæ, exscapus, glycyphyllos, gummifer, mollissimus, 296, 298
Astringents, 34
Atropa Belladonna, mandragora, 494, 498
Atropamine, 496, 497
Atropine sulphate, 496
Atropurpurin, 369, 370
Atrosin, 496, 497
Aubletia trifolia, 328
Aurantium, 332
Ava, 140
Avena sativa, 81, 86
Avenæ farina, 86
Aves, 598

BACTERIUM lactis, 756
Bael, bela fruit, 338
Balæna australis, mysticetus, 598
Balm, 479
  of Gilead, 345
Balmony, 509
Balsam apple, 549
  copaiba, 284
  fir, 71
  Peru, 291
  Tolu, 293
Balsamodendron Opobalsamum, 345
Balsamum gileadense, 345
Baptisia tinctoria, 307
Barb-aloin, 101, 102
Barberry, 396

Barium, carbonate, chloride, dioxide, sulphate, 679, 680
Bark, angustura, 326
    false, 327, 452
  babul, 273
  barberry, 396
  bebeeru, 224
  boxwood, 396
  chittem, 375
  cinchona, 525
  copalchi, 353
  coto, 225
  cotton root, 381
  cramp, 540
  cuprea, copper, 537
  malambo, 353
  margosa, 342
  para-cota, 225
  sassy, mancona, ordeal, 284
  soap, 253
  witch-hazel, 242
Barks, 31
Barley, 87
Barosma betulina, crenulata, Eckloniana, serratifolia, 329, 330, 332
Basham's mixture, 687
Bassorin, 297, 380
Baume tranquille, 501
Bayberry, 403
Bay-laurel, 216
Bdellium, 345
Bean, buck, bog, 455
  St. Ignatius, 452
Bearberry, 433
Bear's-foot, 189
Beaver, 607
Beberine, 224, 225
Beech, American, 146
Belladonna, 494
  Japanese, 498
Belladonnine, 496, 497
Bengal quince, 338
Benne, 516
Benzalcohol, 293
Benzaldehyde, 264, 265
Benzanalgen, 802
Benzanilid, 794
Benzin, 738
Benzoic aldehyde, 265
  sulphinide, 797
Benzoin Benzoin, 225
Benzoinated lard, 602
Benzoinum, benzoin, Catappa, false, 436, 438
Benzo-naphtol, 800
  -para-cresol, 785
Benzoyl aconine, 195
  anilid, 794
  ecgonine, 320
Benzylic benzoate, cinnamate, 293, 295
Berbamine, 200
Berberidaceæ, 46, 199
Berberine, muriate, 186, 187, 188, 200, 207, 210
Berberis canadensis, vulgaris, 200, 396
Bergamiol, 339
Bergamot, 338
Bergaptene (bergamot camphor), 339
Beta-colchicoresin, 110, 111
  eucaine, -naphtol, 800, 806
  vulgaris, 82
Betaine, 353, 380
Betol, 798
Betula alba, lenta, papyrifera, 144, 145
Betulaceæ, 45, 144
Betulin, 144
Bhang, 163
Bilberry, great, 434
Bilirubin, 610
Birch, canoe, paper, sweet, white, 144, 145
Bird's-foot, 392
Bismuth, 716
  and ammonium citrate, 717
  citrate, 717
  oxide, 717
  oxyiodogallate, 788
  salicylate, 718
  subcarbonate, 717
  subgallate, 787
  subnitrate, 716
  subsalicylate, 788
  tribromophenol, 788
Bistort, 175
Bitter-almond, 332
  orange peel, 332
  polygala, 348
  sweet, 490
Bitumen, 740
Black alder, 370
  haw, 541
  hellebore, 189
  mustard, 238
  snakeroot, 189
Blackberry, 248
Bladder wrack, 54
Blatta orientalis, 592
Blisters, 41
Blood, 611
Blue cohosh, 199
  flag, 117
  mass, 722
  stone, 714
  violet, 392
  vitriol, 714
Blumea balsamifera, 224
Bœhmeria nivea, 382
Bone, 611
Boneset, rough, 560, 561
Borax, 651
Borneene, 544
Borneol, 73, 489
Bornyl, 73
Boron, 623
Boro-thymol-zinc iodide, 788
Bos Taurus, 609, 610
Boswellia Carterii, 345
Bougies, 21
Boxwood, box, bush-tree, 208, 396
Brandy, 742
Brassica arvensis, campestris, var. Napus, Rapa, Rutabaga, juncea, nigra, sinapistrum, 238, 239, 241

Brayera, brayerin, 256
Breïn, breïdin, 345
Brimstone, 624
Bromine, bromum, 632
Bromoform, 773
Bromol, 783
Broom, 305
    corn, 82, 88
    Spanish, 307
Brucine, 449, 450
Brunella vulgaris, 475
Bryoidin, 345
Bryonia africana, alba, americana, dioica, epigæa, Kedrostis nana, 210, 551, 552
Bryony, bryonin, bryoresin, 551, 552
Buceras angustifolius, 438
Buchu, 329
Buckthorn, 372, 374
    Carolina, southern, 374
Bulbs, 31
Burdock, 580
Burnett's disinfecting fluid, 706
Burseraceæ, 48, 343
Busenna, 361
Bush, Benjamin, spice, 225
Butea frondosa, 300
Butter, 611
    cup, bulbous, 199
    nut, 140
Butyrum, 611
Buxine, 224
Buxus sempervirens, 208, 396, 434

CACAO, cocoa, 385, 386
Cachets (de pain), 21
Cactus grandiflorus, 392
Cadinene, 75, 76, 134, 215
Cadmium, 710
Cæsalpinaceæ, 47, 274
Caffeidine, 519
Caffeine, 371, 385, 387, 388, 518, 519
    citrate, effervescent, 519, 520
Cajuput, cajuputum, cajuputene, cajuputol, 397, 398, 405
Cajuputi viridiflora, 397
Calabar bean, 309
Calabarine, eseridine, 310, 311
Calamine, 90, 91, 708
Calamus, 89
Calceolaria Ipecacuanha, 525
Calcium, 672
    bromide, 677
    carbonate, 676, 677
        precip., 675
    chloride, 675
    hypophosphite, 677
    phosphate precip., 677
    sulphate dried, 678
Calendula officinalis, 120, 568
Calendulin, 568
Calico-bush, 435
Callitris quadrivalvis, 74, 368
Calomel, 727
Calumba, columbo, 209
    American, 210, 455
Calx, chlorata, 673, 674
Calx sulphurata, 675
Cambogia, 389
Camellia japonica, oleosa, 388
Camera lucida, 816, 817
Campanulaceæ, 50, 552
Camphene, 126
Camphor, Artificial, Barus, Borneo, China, Dutch, Formosa, Japan, Ngai, Sumatra, Tub, 221, 224
    monobromated, 224
Camphorated chloral, 223
Canadian hemp, 456
    moonseed, 206
Canadine, 186, 187
Canarium commune, 345
Canella alba, Winterana, 391
Canellaceæ, 391
Canna edulis, 125
Cannabin, cannabine, cannabinine, 162
    tannate, 162
Cannabinon, cannabinol, cannabindon, 162
Cannabis americana, indica, sativa, 161, 164
Cantharides, cantharidin, 589, 590
Cantharis atrata, cinerea, marginata, Nuttalli, vesicatoria, vittata, 589, 591
Caoutchouc, 348
Caprifoliaceæ, 50, 538
Capsacutin, capsicin, 492
Capsaicin, capsicine, 492, 493
Capsicum annuum, cerasiforme, fastigiatum, frutescens, longum, 492, 494
Capsules, 21
Caramel, 85
Caramelan, 85
Caraway, 415
Carbon, 620
    disulphide, 621
Cardamom, cardamomum, 121
Cardiac depressants (sedatives), 37
    stimulants (tonics), 37
Cardinal-flower, 555
Carex arenaria, 116
Carica Papaya, caroid, 604
Carminatives, 38
Carolina acaulis, 565
Carragheen, 51
Carrot seed, 412
Carthamus tinctorius, 120, 582
Carum Ajowan, Carui, Carvi, Petroselinum, 415, 416
Carvene, carvol, carvacrol, 416, 481, 483
Caryophyllus, caryophyllin, caryophyllene, 399, 400, 401
Cascara sagrada, 375
Cascarilla, cascarillin, 352, 353
Cascarin, 376
Cassia acutifolia, æthiopica, angustifolia, bacillaris, brevipes, elongata, Fistula, grandis (brasiliana), lanceolata, lenitiva, lignea, marylandica, medica, moschata, obovata, officinalis, orientalis, pubescens, vera, wild, 219, 274, 275, 276, 277, 280, 281
Castanea dentata, pumila, sativa, vesca, var. americana, 145, 146

Castilloa elastica, Markhamiana, 349
Castor Fiber, 607
Cataplasm conium, 420
Cataplasms, cataplasmata, 21
Catechin, catechuin, 273, 371
Catechol, 273, 300
Catechu, 271, 273
    pale, red, 273
Cathartics, 38
Cathartocarpus Fistula, 274
Cathartomannit, 279
Catnep, catnip, catmint, 475
Cat's-hair, 359
Caulophylline, caulophyllin, 200
Caulophyllum thalictroides, 199
Caustic potash, soda, 637, 655
Caustics, 41
Cayaponia americana, 552
Ceara, 290
Cedar, prickly, red, white, 76, 77, 78
Celandine, 237
Celastraceæ, 48, 369
Celery fruit, 417
Centaury, American, European, 454
Cephaëline, 522, 523
Cephaëlis acuminata, Ipecacuanha, 520, 524
Cera alba, flava, 592, 593, 594
Cerasus serotina, virginiana, 261
    Laurocerasus, 262
Cerate camphor, 223, 594
    cantharides, 69, 590, 594
    cetacei (spermaceti), 441, 594, 600
    Goulard's, 713
    lead subacetate, 713
    resin, 69, 594
    savine, 77
Ceratum, cerata, cerates, 19, 594, 602
Cerebral-depressants, excitants, 35
Cereus grandiflorus, 392
Cerin, 594
Cerium, oxalate, 684
Cervus Elaphus, 607
Cetacea, 600
Cetaceum (spermaceti), 600
Cetin, 600
Cetraria islandica, 60
Cetrarin, 60
Cevadilla, cevadillene, Cevine, 95, 96
Cevadine, 92, 94, 95, 96
Chalk, French, prepared, 672, 676
Chamæcyparis sphæroidea, 78
Chamomile, German, 569, 570
    Roman, 568
Chamomilla nobilis, 569
Charcoal, 620, 621
Charlock, jointed, 241, 242
Charta, chartæ, 19
    potassii nitratis, 649
    sinapis, 240, 349
Chatinine, 280
Chavicin, 137, 138
Chavicol, 403
Chelerythrine, 235, 237
Chelidonine, 237
Chelidonium majus, 237
Chelidoxanthin, 237
Chelone glabra, 509
Chemical incompatibilities, 27
Chenopodiaceæ, 46, 175
Chenopodium album, ambrosioides, var. anth., anthelminticum, Bonus Henricus, Botrys, Vulvaria, 175, 177
Chermes, 587
Cherry-laurel, 262
Chestnut, 145
    oak, 145
Chicory, 557
Chimaphila corymbosa, maculata, umbellata, 429, 430, 434
Chimaphilin, 429
Chinese blistering flies, 592
    sugar corn, 82
Chinoidine, 530, 534
Chinquapin, 145, 146
Chirata, chiratin, 454, 455
Chloral butyl, 777
    formamide, 778
    hydrate, 746, 777
    urethane, 782
Chloralamide, 778
Chloralose, 778
Chloretone, 749
Chlorine, 630
Chlorodyne, 232
Chloroform, 747, 748, 773
Chocolate tree, 385, 386
Cholagogue purgatives, 39
Cholepyrrhin, 610
Cholesterin, cholesterol, 56, 210, 597, 606, 609
Choline, bilineurine (lupuline), 161, 240, 496
Chondrin, 596
Chondrodendron tomentosum, 207
Chondrus crispus, 51
Choripetalæ, 45, 133
Chromium, 704
Chromogene, 382
Chrysanthemum carneum, Leucanthemum, Parthenium, roseum, segetum, 569, 573
Chrysarobin, 307, 308
Chrysene, 70
Chrysophan, 170, 279
Chrysotoxin, 57
Churrus, charas, 163
Cichoriaceæ, 50, 555
Cichorium Endivia, Intybus, 557
Cigarettes, 22
Ciliary excitants, 37
Cimicifuga racemosa, 189
Cimicifugin, 190, 191
Cinchona australis, barbacœncis, Bonplandia, Calisaya, var. Ledgeriana, Condaminea, cordifolia, crispa, glandulifera, Humboldtiana, lancifolia, micrantha, nitida, officinalis, pedunculata, peruviana, pitayensis, pubescens, purpurea, scrobiculata, succirubra, tucujensis, 525, 526, 527, 528
Cinchona-red, 530, 534

Cinchonicine, 530
Cinchonidine, sulphate, 530, 533
Cinchonine, sulphate, 530, 533
Cinchonism, 536
Cineol, 398, 405, 488, 489
Cinnabar, 729
Cinnamein, 293
Cinnamene, 245
Cinnamic aldehyde, 220
Cinnamomum aromaticum, Burmanni, Camphora, Culilaban, var. rubrum, iners, kiamis, Loureirii, nitidum, obtusifolium, pauciflorum, Sintok, Tamala, zeylanicum, 217, 219, 221
Cinnamon, Anam, Cassia, Ceylon, Chinese, Saigon, 217, 218
Cinnamyl acetate, cinnamate, 220, 293
    cocaine, 320
Cinquefoil, 249
Cissampeline, 208
Cissampelos pareira, 208, 209
Cistaceæ, 388
Citral, 335, 337, 403
Citrene, 335, 337
Citron, 339
Citronellal, 337
Citronellol, 252
Citrullus Citrullus, Colocynthis, 546
Citrus amara, Aurantium, Bergamia, Limon(i)um, medica, sinensis, vulgaris, 332, 333, 334, 336, 338, 339
Civet, 608
Claviceps purpurea, 54
Clotbur, spiny, thorny, 582
Cloves, 399
Clysters, 22
Coca, 318
Cocaine hydochlorate, 320, 805
Cocainism, habit, 321
Cocamine, 320
Coccerin, 586, 587
Coccolobis uvifera, 300
Cocculin, 212
Cocculus indicus, palmatus, 211
Coccus Cacti, ilicis, 585, 587
Cochineal, 585
Cochlearia Armoracea, 241
Cocillana, 343
Cocklebur, 582
Cockroach, 592
Cocos nucifera, 89
Codeine, 228, 229
Coffea arabica, liberica, mauritiana, zanguebaria, 387, 518, 520
Cola acuminata, 387, 520
Cola-nut, 520
Colchicine, colchicein, colchicoresin, 110, 111
Colchicum autumnale, variegatum, 109, 112
Cold cream, 253, 267, 594, 601
Coleoptera, 589
Collinsonia canadensis, 488
Collodion, 384
    cantharidal, 384, 590
    flexible, 72, 384
Collodion styptic, 152, 384
Collodium, collodia, collodions, 19
Collyri-um, a, eye-washes, 21
Colocynth, colocynthin, colocynthein, 546, 547
Colocynthitin, citrullin, 547
Colophony, 68
Columbin, 210
Colutea arborescens, 277
Colza, 241
Comfrey, common, 512
Commiphora africana, Mukul, Myrrha, Opobalsamum, 343, 345
Common Polypody, 64
Compositæ, 50, 560
Compressed tablets, 22
Concentric pills, 23
Concusconine, 530
Condurango, 465
Confectio, confectiones, confections, 19
Confection cassia, 274
    rose, 251, 253
    senna, 158, 263, 274, 279, 282, 418
Conglutin, 263, 266
Coniferæ, 44, 66
Coniferin, 132
Conine (coniine), hydrobromate, hydrochlorate, sulphate, 419
Conium maculatum, 413, 418, 420
Conquinamine, 530
Conserva tamarindi, 282
Contrayerva, 158
Convallariaceæ, 45, 107
Convallaria majalis, multiflora, 107, 108
Convallarin, convallamarin, convallamaretin, 108
Convolvulaceæ, 49, 465
Convolvulin, 467
Convolvulus Mechoacanna, panduratus, Scammonia, 469
Conydrine, 419
Conyza squarrosa, 512
Copaiva cordifolia, coriacea, guianensis, Jacquini, Jussieui, Langsdorffii, Martii, multijuga, nitida, officinalis, 284, 286, 287
Copal, 287
Copper (cuprum), acetate, subacetate, sulphate, 714, 715
Copperas, 689
Coptis trifolia, 189
Coral, 588
Corallium rubrum, 588
Cordial, rhamnus Purshiana, 376
Coriander, 417
Coriandrol, linalool, 418
Coriandrum sativum, 417
Coriaria myrtifolia, 277
Cornaceæ, 428
Corn silk, 78, 79
Cornsmut, 58
Cornus Amonum, circinata, florida, sericea, 428, 429
Cornutine, 56, 57
Corrosive sublimate, 724
Coscinium fenestratum, 210

Cotoin, 225
Cotton, medicated, 381, 382, 383, 384
Couchgrass, 85
Counter-irritants, 40
Cowage, 312
Cowberry, 434
Cow parsnip, 413
Crabs' eyes, stones, 588
Cracca apollinea, 277
Cranesbill, 312
Cream of tartar, 377
Creolin, 785
Creosol, 324, 763
Creosote, 70, 763
Cresol, 785
Crisped-leaved, cross or curled mint, 484
Crocin, 120
Crocus sativus, 119
Croton chloral hydrate, 777
  Eluteria, lucidus, Malambo, niveus, Pseudochina, Tiglium, 349, 352, 353, 461
Crotonol, croton-resin, 351
Cruciferæ, 47, 238
Cubeba, cubeb, 134
  canina, crassipes, Cubeba, Wallichii, 136
Cubebin, 134, 135
Cucumis Citrullus, myriocarpus, 546, 549
Cucurbita Citrullus, Pepo, 545, 546
Cucurbitaceæ, 50, 545
Cucurbitine, 546
Cudbear, 61
Cumol, 70
Cupreine, 530
Cupressus thyoides, 78
Cupuliferæ, 45, 145
Curara, curare, 452
Curcuma longa, Zedoaria, 81, 127, 128
Curcumin, 128
Cusparia Angostura, 326
Cusso, kousso, 256
Cuttle-fish bone, 588
Cydonia Cydonia, 267
Cymene, 405, 481
Cymol, 222
Cynanchum acutum, monspeliacum, Vincetoxicum, 347, 470, 542
Cypripedin, 130
Cypripedium hirsutum, parviflorum, pubescens, 129, 130, 166
Cytisus scoparius, 305

DÆMONOROPS (Calamus) Draco, 88
  Damiana, 392
Dammar, 74
Dandelion, 555
Daphne Gnidium, Laureoa, Mezereum, salicifolia, 393, 394
Daphnin, 393, 394
Datura alba, fastuosa, Metel, sanguinea, Stramonium, Tatula, 502, 505
Daturine, 504
Daucus Carota, 412
Decoction althæa, 380
  anamirta, 212
Decoction apocynum, 457
  arnica, 580
  asclepias, 464
  calendula, 568
  caulophyllum, 200
  cetraria, 61
  chenopodium, 176
  chimaphila, 430
  chondrus, 53
  cimicifuga, 191
  cinchona, 535
  corn silk, 80
  cotton-root bark, 383
  dulcamara, 492
  euonymus, 370
  eupatorium, 561
  flaxseed, 317
  frangula, 374
  geranium, 313
  guaiacum, 324
  hæmatoxylon, 284
  hamamelis, 244
  hydrastis, 188
  inula, 565
  ipecac, 523
  juglans, 141
  lappa, 582
  pareira, 209
  phytolacca, 178, 179
  pomegranate, 397
  quercus alba, 148
  rhus glabra, 365
  rubus, 249
  rumex, 174
  sarsaparilla, 116
    comp., 116, 216, 304, 324, 394
  scoparius, 306
  scutellaria, 474
  stillingia, 358
  strophanthus, 459
  taraxacum, 557
  triticum, 86
  uva-ursi, 435
  viburnum, 541
  xanthoxylum, 326
Decoctum, decocta, decoctions, 19
Delphinine, delphisine, 192, 193
Delphinium Ajacis, azureum, carolinianum, Consolida, exaltatum, Staphsagria, urceolatum, 191
Delphinoidine, 192
Demulcents, 41
Dendrium buxifolium, 434
Dental anodynes, 38
Deodorants, 35
Depresso-motors, 36
Dermatol, 787
Desoxyalizarin, 308, 801
Dewberry, 248
Dewees' carminative, 424
Dextrin, dextrinum, 82
Dextro-lichenin, 60
Dextrose, 84
Diallyldisulphide, 97
Diaphoretics, 39
Diaptherin, 802

Diastase, 604
Dicotyledones, 45, 133
Digestive acids, ferments, 33
Digitalein, digitin, digitogenin, 514
Digitalin, digitoflavon, digitalosmin, 513, 514
Digitalis ochroleuca, purpurea, 512
Digitoxin, digitonin, digitophyllin, 514
Di-iodo-betanaphtol, 801
Dill fruit, seed, 415
Dimethylxanthine, 386, 806
Dioscorea villosa, 541
Diospyros virginiana, 436
Dioxy-anthrol, 801
Dipentene, 123
Dipterocarpus alatus, 287
Disinfectants, 35
Dispensatories, 18
Di-thymol-di-iodide, 786
Diuretics, 39
Diuretin, 387, 806
Dock, broad-leaved, red-veined, water, yellow, 173, 174
Dogbane, spreading, 457
Dog-fennel, 562
Dogwood, flowering, round-leaved, swamp, 428, 429 ; Jamaica, 299
Dorema Ammoniacum, Aucheri, robustum, 426, 428
Dorstenia Contrayerva, 158
Dosimetric parvules, 22
Draconis resina, 88
Dragée, 22
Dragons' blood, 88
Drimys Winteri, var. granatensis, 181, 225
Drupaceæ, 47, 260
Dryobalanops aromatica, Camphora, 224
Dryopteris athamantica, Filix mas, marginalis, rigida, 62, 64
Duboisia myoporoides, 502
Duboisine, 497, 502
Dudgeon, 434
Dulcamara, dulcamarin, 490
Dulcin, 782
Dulse, 54
Dutch liquid, 774

EBENACEÆ, 436
Ecballium Elaterium, 550
Ecbolics, 40
Ecboline, 56
Ecgonine, 320
Ecuelle (à piquer) process, 339
Egg shell, 599
Elæis guineensis, 89
Elastica, 348
Elaterid, ecballin, 551
Elaterin, elaterium, 550, 551
Elder, dwarf, prickly, 538, 539, 407
Elecampane, 512, 564
Elemi (manila), 345
Elettaria Cardamomum, major, repens, 121, 124
Elixir, aromatic, 336
  elixira, elixirs, 19
Elixir phosphorus, 414, 628
  vitriol, 626
Elm, 156
Emetics, 38
Emetine, 522
Emmenagogues, 40
Emodin, 101, 102, 170, 171, 373, 374
Emollients, 41
Emplastrum, emplastra, 19
Empleurum serrulatum, 330, 332
Emulsin, 261, 263, 264, 266
Emulsion ammoniac, 427
  amygdala, 266, 270
  asafetida, 424
  chloroform, 748
  kousso comp., 257
  oil theobroma, 99
  pepo, 546
Emulsum, emulsa, emulsions, 19
Endermic method, 24
Enemas, enemata, 22
  asafetida, 424
Enepidermic method, 24
Entada scandens, 310
Enteric pills, 23
Epidermic method, 24
Epigæa repens, 434
Epipremnum mirabile, 91
Epispastics, 41
Epsom salt, 670
Erechtites hieracifolia, 563
Ergochrysin, 57
Ergot, 54
Ergotin, Bonjean's, 56, 57
Ergotinine, ergotine, 56, 57
Ergotism (acute, chronic), 58
Ericaceæ, 49, 430
Ericolin, 429, 434, 472
Erigeron annuus, canadensis, heterophyllus, philadelphicus, 563, 564
Eriodictyon californicum, glutinosum, 471
  tomentosum, 473
Erodium cicutarium, moschatum, 313
Errhines, 37
Ertela trifolia, 328
Eryngium aquaticum, yuccæfolium, 413
Erythræa Centaurium, 454
Erythronium americanum, 107
Erythrophlœum guineense, 284
Erythroretin, 170, 171
Erythroxylaceæ, 47, 318
Erythroxylon Coca, var. bolivianum, Spruceanum, 318, 320
Escharotics, 41
Essence de petit grain, Bigarade, petale, Portugal, 333, 335
  pepsin, 604
Essences, essentiæ, 22
Ethene chloride, 774
Ether, hydrobromic, sulphuric, 757, 775, 781
Ethyl bromide, 775
  carbamate, 781
  chloride, 774
  cinnamate, 245
  nitrite, oxide, 781

Ethyl urethane, 781
  vanillin, 245
Ethylated chloral urethane, 782
Ethylene bichloride, 774
  bromide, 775
Ethylenimine, 801
Ethylidene chloride, 774
Eucaine, alpha, beta, 805, 806
Eucalyptene, eucalyptolene, 405
Eucalyptol, 398, 405
Eucalyptus amygdalina, dumosa, globulus, goniocalyx, Gunni, Leucoxylon, obliqua, oleosa, resinifera, sideroxylon, viminalis, 300, 404, 407, 444
Eucheuma gelatinæ, spinosum, 54, 596
Eugenia aromatica, Jambolana, 399, 401
Eugenol, eugenin, 181, 215, 400, 401, 402, 403, 444, 790
  acetamide, 790
Euonymin, 369, 370
Euonymus americanus, atropurpureus, europæus, 369, 370
Eupatorin, 560
Eupatorium capillifolium, fœniculaceum, glutinosum, perfoliatum, purpureum, teucrifolium, verbenæfolium, 139, 560, 561, 562
Euphorbia corollata, Ipecacuanha, pilulifera, 358, 359
Euphorbiaceæ, 48, 348
Euphorin, 781
Europhen, 787
Exalgin, 792
Excito-motors, 36
Exogonium purga, 466
Expectorants, 37
Explosions, 28
External medication, 25
Extract absinthium, 575
  aconite, 195
  aloes, 102
  anthemis, 570
  apocynum, 457
  arnica, 579, 580
  aspidium, 63
  aspidosperma, 461
  belladonna alc., 497, 498
  calamus, 91
  calendula, 568
  calumba, 211
  capsicum, 494
  cascarilla, 353
  caulophyllum, 200
  chelidonium, 237
  chimaphila, 430
  cimicifuga, 191
  cinchona, 534, 535
  colchicum, 111
  colocynth, 548
    comp., 103, 123, 471, 548
  conium, 419
  convallaria, 108
  corn silk, 80
  cubeb, 136
  cypripedium, 131
Extract digitalis, 514
  dulcamara, 492
  ergot, 57
  eriodictyon, 473
  eucalyptus, 406
  euonymus, 370
  eupatorium, 561
  frangula, 374
  gelsemium, 446
  gentian, 453
  glycyrrhiza, pure, 303, 304
  Goulard's, 712
  grindelia, 562
  guarana, 372
  hæmatoxylon, 284
  hamamelis, 244
  hops, 160
  horehound, 475
  hyoscyamus, 501
  indian cannabis (hemp), 162
  ipecac, 523
  iris, 117
  jalap, 467
  juglans, 141
  juniper, 75
  krameria, 289
  lappa, 582
  leptandra, 508
  lobelia, 554
  lupulin, 161
  malt, 87
  mezereum, 394
  nux vomica, 450
  opium, 230
  pareira, 209
  physostigma, 311
  pilocarpus, 328
  podophyllum, 202
  Pond's, 244
  pulsatilla, 198
  quassia, 341
  quercus alba, 148
  quillaja, 254
  rhamnus Purshiana, 376
  rhubarb, 171
  rubus, 249
  rumex, 174
  sarsaparilla, 116
  savine, 77
  scutellaria, 474
  senna, 280
  squill, 100
  staphisagria, 192
  stillingia, 358
  stramonium, 504
  strophanthus, 459
  sumbul, 426
  taraxacum, 557
  triticum, 86
  uva-ursi, 435
  valerian, 544
  veratrum viride, 94
  viburnum, 541
Extractum, extracta, extracts, 19
Eye-washes, 21

FABIANA imbricata, 505
Factitious Oregon Balsam of Fir, 71
Fagaceæ, 45, 145
Fagus americana, ferruginea, pumila, sylvatica, 146, 382
False cubebs, 136
Families (natural orders), 42, 44
Fats and fatty oils, 33
Feather geranium, 177
Febrifuges, 33
Fel bovis, purified, 610
Fenchone, 411
Fennel, dog, 410, 562
Fermentum, 58
Ferrum, iron, 685
Ferula fœtida, galbaniflua, Narthex, Sumbul, tingitana, 421, 424, 425, 428
Ferulyl sulphide, 424
Fever-wort, 542
Ficus Carica, elastica, indica, religiosa, 157, 349
Fig, 157
Figwort, 509
Filicic anhydride, 63
Filicin, 63
Filicinæ, 44, 61
Filix-red, 63
Flake-white, 710
Flaxseed, cake, meal, poultice, 316, 317, 318
Fleabane, Canada, Philadelphia, various-leaved, 563, 564
Fleawort, 565
Flemingia rhodocarpa, 361
Florentine orris, 118
Flowering fern, 64
Flowers and petals, 31
  of arsenic, sulphur, 624, 730
Fluavil, 436
Fluid extract absinthium, 575
  aconite, 195
  anamirta, 212
  anise, 414
  anthemis, 570
  apocynum, 457
  arnica flowers, root, 580
  aromatic powder, 220
  asclepias, 464
  aspidium, 63
  aspidosperma, 461
  belladonna, 497, 498
  bitter-orange peel, 333
  bryonia, 552
  buchu, 331
  calamus, 91
  calendula, 568
  calumba, 211
  capsicum, 493
  caraway, 416
  cascarilla, 353
  castanea, 146
  caulophyllum, 200
  chelidonium, 237
  chenopodium, 176
  chimaphila, 430
  chirata, 455
Fluid extract cimicifuga, 191
  cinchona, 535
  cinnamon, 221
  coca, 320
  colchicum, root, seed, 111
  colocynth, 549
  conium, 420
  convallaria, 108
  coriander, 418
  corn silk, 80
  cotton-root bark, 383
  cubeb, 135, 136
  cypripedium, 130, 131
  digitalis, 515
  dulcamara, 491
  ergot, 57
  eriodictyon, 472
  eucalyptus, 405, 406
  euonymus, 370
  eupatorium, 561
  fennel, 411
  frangula, 374
  gelsemium, 446
  gentian, 454
  geranium, 313
  ginger, 126
  glycyrrhiza, 304
  grindelia, 562
  guarana, 371
  hæmatoxylon, 284
  hamamelis, 243
  hedeoma, 478
  hops, 160
  horehound, 474
  hydrastis, 187
  hyoscyamus, 501
  indian cannabis (hemp), 163
  inula, 565
  ipecac, 523
  iris, 118
  jalap, 468
  juglans, 141
  juniper, 75
  kamala, 361
  kino, 301
  kousso, 257
  krameria, 290
  lactucarium, 559
  lappa, 581
  leptandra, 509
  lobelia, 554
  lupulin, 161
  matico, 139
  melissa, 479
  menispermum, 207
  mezereum, 394
  myrrh, 345
  nutgall, 151
  nux vomica, 451
  pareira, 209
  pepo, 546
  pepper, 138
  peppermint, 486
  phytolacca fruit, root, 178
  pilocarpus, 328
  podophyllum, 203

Fluid extract pyrethrum, 573
  quassia, 341
  quercus alba, 148
  quillaja, 254
  rhamnus Purshiana, tasteless, 376
  rhubarb, 171, 172
    aromatic, 172
  rhus glabra, toxicodendron, 364, 366
  rose, 251
  rubus, 249
  rumex, 173
  sage, 476
  sambucus, 539
  sandal wood, 165
  sanguinaria, 236
  sarsaparilla, 116
    comp., 116, 216, 304, 394
  sassafras, 216
  savine, 77
  scoparius, 306
  scutellaria, 474
  senega, 347
  senna, 279
  serpentaria, 167
  spearmint, 484
  spigelia, 448
  squill, 99
  staphisagria, 192
  stillingia, 358
  stramonium, 504
  sumbul, 426
  tansy, 574
  taraxacum, 557
  tea, 388
  thyme, 481
  triticum, 86
  uva-ursi, 435
  valerian, 544
  veratrum viride, 94
  viburnum opulus, 540
    prunifolium, 541
  wild cherry, 262
  xanthoxylum, 326
Fluid-um, a, extract-um, a, Fluid extracts, 19
Fly Fungus, 59
Fœniculum capillaceum, dulce, Fœniculum, sativum, vulgare, 410, 411
Fomentations, fomenta, 22
Formaldehyde, 776
Formalin, formal, formol, 776
Formanilid, 791
Formica rufa, 592
Formin, 777
Foxglove, 512
Fragaria vesca, 579
Frangula, frangulin, 372, 373
Frankincense, 345
Frasera carolinensis, Walteri, 210, 455
Fraxin, 443, 444
Fraxinus excelsior, ornus, 442, 444
Frostworth, 388
Fruit sugar, levulose, 538
Fruits, 31
Fuchsin, 820
Fucus nodosus, vesiculosus, 53, 54
Fuller's Earth, 684
Fungi, 44, 54

GADUS æglefinus, callarias, carbonarius, merluccius, Morrhua, pollachius, 595, 596, 597
Galactagogues, 40
Galactose, 611
Galanga, galangal, 129
Galbanum, 424
Galipea Cusparia, 326
Galla, 149
Gallacetophenone, 796
Gallanilid, gallanol, gallinol, 794
Gallinæ, 598
Galls, 149
Gallus Bankiva var. domes., 599
Gambir, 273
Gamboge, 389
Gamopetalæ, 49, 429
Ganja, guaza, gunjah, 162, 163
Garcinia indica, Mangostana, Morella, pictoria, purpurea, travancorica, 338, 389, 391
Gardenia florida, glandiflora, radicans, 121
Gargles, gargarismata, 22
Garlic, 97
Gaultheria procumbens, 431
Gaultherin, 144
Gelatin, 53, 596
Gelatina saccharata, 61
Gelsemine, gelseminine, gelsemin, 445, 446
Gelsemium sempervirens, 445
Gentian, Elliott's, 452, 454
Gentiana Catesbæi, Elliottii, Horse, lutea-pannonica, puberula, punctata, pur, purea, 452, 454, 542
Gentianaceæ, 49, 452
Gentianin, gentianose, gentisin, gentiopicrin, 453
Genus, genera, 42
Geraniaceæ, 47, 312
Geranial, 335
Geranin, geraniol, 252, 337, 488
Geranium maculatum, moschatum, Robertianum, 312, 313
Germicides, 35
Geum rivale, urbanum, 249, 579
Gigartina acicularis, mamillosa, pistillata, 51, 52, 53, 54
Gigartinaceæ, 44, 51
Gillenia stipulacea, trifoliata, 256
Ginger, gingerol, 125, 126
    wild, 168
Ginseng, Chinese, 166, 407
Glauber's salt, 662
Glaucium corniculatum, Glaucium, luteum, 238
Glucose, dextrose, 84, 86
Glycerin, 744
Glycerite of boroglycerin, 623
    carbolic acid, 762
    hydrastis, 187, 188
    pepsin, 604
    starch, 80

Glycerite of tannic acid, 152
    yolk of egg, 599
Glycerit-um, a, glycerites, 20
Glycine hispida, 305, 517
Glycocoll, 610
Glycyrrhiza ammoniated, echinata, glabra, var. glandulifera, glandulifera, lepidota, 301, 302, 304, 305
Glycyrrhizin, glycyramarin, 303
Gnaphalium obtusifolium, polycephalum, 564
Gold, aurum, 735
    and sodium chloride, 735
    thread, 189
Golden rod, sweet or anise-scented, 563
    seal, 185
Gonolobus Condurango, 465
Good King Henry, 177
Goosefoot, fetid, 177
Gossypium album, arboreum, barbadense, herbaceum, nigrum, religiosum, 381, 383, 384
Gourd towel, 549
Gracilaria lichenoides, 572
Graminaceæ, 44, 78
Granatum, 395
Granules, 22
Graphic formulas, 769, 770, 771
Gravel plant, 434
Griffith's mixture, 700, 701
Grindelia glutinosa, hirsutula, robusta, squarrosa, 562, 563
Grindeline, 562
Ground laurel, 434
Guaiac, beta-resin, yellow, 322, 324
Guaiacene, guaiacol, 324, 788
Guaiacol benzoate, 788
    carbonate, cinnamate, 789
    salicylate, 789
Guaiacum angustifolium, officinale, sanctum, 322, 325
Guarana, 371, 520
Guaranine, 371, 519
Gum arabic, acacia, 267
    Bassora, cashew, cherry, Kutera, 297
    copal, 287
    Mecca, 345
    mesquite, 269
    olive, lecca, 442
    sweet, 246
Gutta percha. 435
Guttiferæ, 48, 389
Gymnospermæ, 44, 66

HÆMATEIN, hæmatin, 284
Hæmatics, 33
Hæmatoxylin, 284, 820
Hæmatoxylon campechianum, 282
Hæmostatics, 41
Hagenia abyssinica, 256
Halogens, haloids, 630
Halymenia edulis, palmatus, 54
Hamamelidaceæ, 47, 242
Hamamelis virginiana, 242
Hardhack, 255
Hardwickia pinnata, 286, 287
Harts-horn, 607
Haschisch, hasish, 164
Hayden's viburnum comp., 541
Heal-all, 475
Hedeoma piperita, pulegioides, thymoides, 477, 478
Hedeomol, 478
Helenin, 565
Helianthemum canadense, 388
Heliotropin, 138
Hellebore, American, black, false, green, white, 92, 94, 189
Helleborin, helleborein, helleboretin, 189
Helleborus fœtidus, niger, viridis, 189
Helonias officinalis, 95
Hemiptera, 585
Hemlock, small, 419, 421
Hemp, American, fibre, Indian, 161, 164
Hempseed, 164
Henbane, 499
Hepatica Hepatica, triloba, 198
Heracleum lanatum, 413
Herbs, 31
Hercules' Club, 407
Hermodactyls oriental, 112
Heron's-bill, 313
Hesperidene, hesperidin, 333, 335, 337, 338
Heuchera americana, 246
Hevea brasiliensis, discolor, guianensis, 349
Hibiscus, 381
Hiera picra, 103, 391
Hircin, 608
Hirudo, 588
Hollyhock, 381
Homatropine, 496
Homo-chelidonine, 235
    pterocarpin, 298
    quinine, 530
    strychnine, 449
Homoflemingin, 361
Homogeneous immersion, 811
Honey, 592, 593
Honeys, 20
Hops, 158
Hop tree, three-leaved, 365
Hordeum distichon, 87
Horehound, wild, 474, 561
Horsebalm, 488
    mint, 477, 482
    nettle, 492
    radish, 241
Humulus Lupulus, 158
Hydracetin, 795
Hydrargyrum, 721
Hydrastin, hydrastine, 186, 188
Hydrastinine hydrochlorate, 187
Hydrastis canadensis, 166, 185
Hydrocarbons, 738, 772
Hydrochinone, 790
Hydroelaterin, 551
Hydrogen, 615
Hydrophobia antidote, 612
Hydrophyllaceæ, 50, 471
Hydroquebrachine, 461
Hydroquinine, 530

Hydroquinone, 790
Hydrous Wool-fat, 608, 609
Hydroxylamine hydrochloride, 308
Hygienic agents, 18
Hygrine, 320
Hymenoptera, 592
Hyoscine hydrobromate, 499, 500, 501, 504
Hyoscipicrin, 499, 501
Hyoscyamine, 496, 497, 499
    hydrobromate, sulphate, 499, 500
Hyoscyamus agrestis, albus, aureus, niger, pallidus, Scopolia, 498, 499, 502
Hypnal, 805
Hypnone, 796
Hypnotics, 35
Hypocreaceæ, 44, 54
Hypodermic injection, needle, 23, 24
Hypodermoclysis, 24
Hyrax capensis, Hyraceum, 607
Hyssopus officinalis, 480

ICHTHYOCOLLA, isinglass, 594
Ichthyol, 786
Ichthyomethia Piscipula, 299
Igasurine, 449, 450
Ilex paragu(ay)ensis, verticillata, 370, 388
Ilicaceæ, 370, 388
Illicium anisatum, floridanum, parviflorum, religiosum, verum, 179, 180, 181
Imperatoria Ostruthium, 194
Incompatibility, 27
    chemical, 27
    pharmaceutical, 28
    therapeutical, 29
Indian cannabis, hemp, 161
    corn, 78
    physic, 256
    turnip, 91
India rubber, 348
Indigo, false, wild, 307
Inflatin, 553
Infusion absinthium, 575
    anise, 414
    anthemis, 570
    arnica flowers, 580
    belladonna, 498
    bryonia, 552
    buchu, 331
    calamus, 91
    calumba, 211
    capsicum, 494
    caraway, 416
    cardamom, 124
    cascarilla, 353
    castanea, 146
    caulophyllum, 200
    cetraria, 61
    chelidonium, 237
    chirata, 455
    cinchona, 535, 626
    cinnamon, 221
    cloves, 401
    coca, 321
    cochineal, 587
Infusion convallaria, 108
    coriander, 418
    cubeb, 136
    cypripedium, 131
    digitalis, 220, 515
    dulcamara, 492
    ergot, 57
    eucalyptus, 406
    eupatorium, 561
    fennel, 411
    flaxseed, 317
    gentian comp., 454
    ginger, 127
    guarana, 372
    hedeoma, 478
    hops, 160
    horehound, 475
    hyoscyamus, 501
    illicium, 180
    inula, 565
    ipecac, 523
    juniper, 75
    kino, 301
    kousso, 257
    krameria, 290
    lappa, 582
    lobelia, 554
    matico, 139
    matricaria, 571
    melissa, 479
    mustard, 240
    nutgall, 151
    pareira, 209
    peppermint, 486
    pilocarpus, 328
    pimenta, 403
    pulsatilla, 198
    quassia, 341
    quillaja, 254
    rhubarb, 172
    rhus glabra, 365
    rose, 251, 252
    saffron, 120
    sage, 476
    sambucus, 539
    sanguinaria, 236
    sassafras, 216
    savine, 77
    senega, 347
    senna comp., 280, 411, 444, 670
    serpentaria, 167
    spearmint, 483
    spigelia comp., 448
    tansy, 574
    tea, 388
    triticum, 86
    uva-ursi, 435
    valerian, 544
    viburnum opulus, 541
        prunifolium, 541
    wild cherry, 262
Infus-um, a, infusions, 20
Ingluvin, 604
Inhalations, 22
Injections, 22
Inosit, 85, 86

Insufflations, 22
Intravenous injection, 25
Inula dysenterica, Helenium, squarrosa, 512, 564, 565
Inulin, inulol, 565, 581
Invertebrata, 585
Iodantipyrine, 805
Iodina rhombifolia, 461
Iodine, iodum, 633
Iodine-green, 820
Iodo-acetanilid, 792
 -antifebrin, 792
Iodoform, 750, 774
Iodol, 805
Iodopyrine, 805
Ionidium Ipecacuanha, 525
Ipecac, American, bastard, farinaceous, striated, undulated, white, wild, 256, 359, 465, 520, 525
Ipomœa Jalapa, orizabensis, pandurata, simulans, 466, 469, 470
Iridaceæ, 45, 117
Iris florentina, fœtidissima, germanica, pallida, pseudacorus, versicolor, 117, 118
 diaphragm, 812, 813
Irisin, iridin, 118
Iron, ferrum, 685
 and ammonium citrate, 695
  sulphate, 692
  tartrate, 696
 and potassium tartrate, 697
 and quinine citrate, soluble, 535, 693, 694
 and strychnine citrate, 696
 arsenate, 701
 bromide, 701
 carbonate saccharated, 655, 699
 chloride, 686
 citrate, 693
 dialyzed, 688
 ferrocyanide, 701
 filings, 686
 hydrated oxide, 697
  with magnesia, 698
 by hydrogen, 686
 hypophosphite, 701
 iodide saccharated, 688
 lactate, 689
 oxalate, 690
 phosphate soluble, 662, 694
 pyrophosphate soluble, 662, 695
 reduced, 686
 subcarbonate, 700
 sulphate, 689
  dried, 690
  granulated, 690
 sulphide, 701
 valerianate, 698
Irritants, 40
Isaconitine, 194, 195
Isinglass, American, 594, 595
 Chinese, Japanese, 596
 pipe, purse, 595
Isoemodin, 373, 374
Isolichenin, 60

JABORANDI, jaborine, 327, 328
Jalap, 466
Jalapin, jalapurgin, 467, 468, 469, 470
Jalaps, false, fusiform, male, Tampico, 461
Jambul, Java plum, 401
Jateorrhiza Columba, palmata, 209, 211
Jeaunel's general antidote, 828
Jelly of cetraria, 61
Jequirity, 305
Jerusalem Oak, 177
Jervine, 92, 94
Jimson weed, 502
Juglandaceæ, 45, 140
Juglandin, 141, 142
Juglans cinerea, nigra, regia, 140, 142
Juglone, 141
Juice chelidonium, 237
 chenopodium, 176
 conium, 420
 garlic, 97
 horehound, 475
 lemon, 117
 rhus toxicodendron, 366
 sambucus, 539
 taraxacum, 557
Juices, 22
Juniper, juniperus communis, Oxycedrus, Sabina, virginiana, 74, 76, 77, 134
Juniperin, 75

KALMIA latifolia, 435
Kamala, 359
Kaolin, 684
Kava-kava, 140
Kermes, 587
 mineral, 732
Ketones, 796
Kino, 299
Kinoin, kino-red, 300, 301
Kinone, 534
Kolanin, kolazym, 387
Konseals, 21
Kosin, koussein, koussin, kussin, 256
Kosso-toxin, 256, 257
Kousso, 256
Krameria argentea, granatensis, Ixina, lanceolata, secundiflora, tomentosa, triandra, 288, 289, 290
Krameriaceæ, 47, 288
Kresylol, 785

LABIATÆ, 50, 473
Lactophenin, lactyl-phenetidine, 793
Lactuca altissima, canadensis, elongata, sagittata, sativa, virosa, 557, 559, 560
Lactucarium, garden, lettuce, wild, 557, 559
Lactucerin, lactucin, 559
Lactucopicrin, lactucon, 559
Ladies' slipper, 129
Lamb's quarters, 177
Lamellæ, scales, 22
Lanolin, 608
Lapathin, 173
Lapis divinus, 715
 infernalis, 719

Lappa, fructus, 580, 582
Lard, 601, 602
Larix europæa, Larix, siberica, 70, 72, 444
Larkspur, 193
Lauraceæ, 46, 214
Laurel, mountain, 435
Laurus nobilis, laurel, 225
Lavandula angustifolia, officinalis, spica, stœchas, 487, 488
Lavender, French, male, 487, 488
Laxatives, 38
Lead, acetate, carbonate, iodide, nitrate, oxide, plaster, red oxide, 710, 711, 712, 713, 714
Leaves, leaflets, leafy tops, 31
Lecanora tartarea, 61
Lecithin, 239
Leech, 588
Leek, 98
Leguminosæ, 47
Leiophyllum buxifolium, 434
Lemon-peel, juice, 336, 338
Lemons, 338
Leontin, 200
Leptandra, leptandrin, 508
  virginica, 508
Leptilon canadense, 563
Lerp, 444
Leucanthemum vulgare, 573
Leuko-alizarin, 801
Levulose, 85
Lichenes, 44, 59
Lichenin, 60
Lichen starch, 60
Life everlasting, 564
Lignum Colubrinum, 452
  vitæ, 323
Liliaceæ, 45, 97
Lily of the valley, 107
Lime, burned, 673
Limon, lemon, 336
Limonene, 333, 335, 337
Limonium carolinianum, 435
Linaceæ, 47, 316
Linalool, acetate, 339, 481, 488
Lindera Benzoin, 225
Liniment aconite, 50
  ammonia, 384, 617
  belladonna, 223, 497
  camphor, 223, 384
  chloroform, 441, 748
  delphinine, 192
  lime, 317, 673
  mustard comp., 223, 240, 394
  soap, 223, 441, 489
    soft, 317
  turpentine, 68, 69
Liniment-um, a, liniments, 20
Linolein, linoxyn, 317
Linseed, 316
Linum usitatissimum, 316
Liquidambar orientalis, styraciflua, 244, 246
Liquid pepsin, 604
Liquid (soluble) glass, 622
Liquor, liquores, liquors, 20
Liquor acidi arsenosi, 730
  arseni et hydrarg. iod., 725, 731
  barii chloridi, 680
  calcis, 673
  ferri acetatis, 699
    chloridi, 687
    citratis, 692
    et ammonii, acet., 687
    nitratis, 699
    subsulphatis, 691
    tersulphatis, 691
  gutta-perchæ, 436
  hydrargyri nitratis, 728
  iodi compositus, 634
  magnesii citratis, 637, 672
  morphinæ sulphatis, 232
  plumbi subacetatis, 711, 712
      dil., 713
  potassæ, 638
  potassii arsenitis, 637, 730
    citratis, 637, 640
  sodæ, 656
    chloratæ, 654, 674
  sodii arsenatis, 660
    silicatis, 622
  zinci chloridi, 706
Liquorice (root), 301
  indian, wild, 305
Liriodendrin, 182
Liriodendron Tulipifera, 181
Litharge, 711
Lithium, benzoate, bromide, carbonate, citrate, citrate efferves., salicylate, 663, 664, 665
Lithotriptics, 39
Litmus, lacmus, 61
Liverwort, noble, 198
Lobelia cardinalis, inflata, syphilitica, 553, 555
Lobelin, lobeline, lobelacrin, 553, 554
Loganiaceæ, 49, 444
Loganin, 449, 450
Logwood, 282
Lonicera Periclymenum, 356
Lophophora Lewinii, 392
Losophane, 786
Lotio, flava, nigra, 726, 727
Lotions, 22
Loxopterygium Lorentzii, 461
Lozenges, 22
Luffa ægyptiaca, Luffa, operculata, 549
Lunar caustic, 718, 719
Lung medication, 24
Lupulin, lupulinum, 159, 160
Lycium afrum, umbrosum, vulgare, 492
Lycopodiaceæ, 44, 64
Lycopodinæ, 44, 64
Lycopodium annotinum, clavatum, complanatum, inundatum, 64, 65
Lycopus virginicus, 484
Lyperia crocea, 120
Lysol, lysolum, 786
Lythraceæ, 49, 394

MACE, 184
  Macene, 185
Macrotin, 191
Madder, 525
Magnesia, calcined, heavy, light, 671
Magnesium, 669
  carbonate, citrate efferves., sulphate, 670, 671
Magnolia acuminata, glauca, tripetala, virginiana, 181
Magnoliaceæ, 46, 179
Maidenhair fern, 64
Majoon, 163
Malefern, 62
Mallotus philippinensis, 359
Mallow, 379, 381
Maltum, malt, 87
Malus Malus, 267
Malvaceæ, 48, 379
Malva rotundifolia, sylvestris, vulgaris, 381
Mammalia, 600
Mandragora autumnalis, officinalis, vernalis, 498
Mandrake, 201
Man of the Earth, 469
Manganese, 703
  dioxide, sulphate, 703
Mango fruit, 391
Manihot Manihot, utilissima, 82, 357
Manna, mannit, 442, 443, 444
  Armenian, Briançon, Persian, Tamarisk, 444
Manzanita, 435
Maranta arundinaceæ, 81, 124
Marigold, 568
Marjoram, sweet, wild, 480
Marrubiin, 474
Marrubium vulgare, 474
Marsdenia Condurango, 465
Marsh-mallow, 379
Maruta Cotula, 569, 570, 571
Mary thistle, 582
Massa, massæ, masses, 20
Massa copaibæ, 287
  ferri carbonatis, 654, 700
  hydrargyri, 304, 380, 722
Masterwort, 194, 413
Mastic, masticin, 367, 368
  Bombay, 369
Maté, 388
Materia medica, 17
Maticin, 139
Matico, 139
Matricaria Chamomilla, 569, 570
May apple, 201
  flower, 434
  weed, 570
Meconin, meconoiosin, 187, 228
Mechanical agents, 18
Medicago sativa, 495
Medicines, avenues of, 23
  chemical constituents, 29
  classification of, 29
  conditions modifying action, dose, 25
  forms of, 18
Medicines, incompatibilities, 27
  transmission of, 25
Mel, mella, mellita, 20
Mel, honey, 592, 593
  despumatum, 593
  rosæ, 251, 593
Melaleuca Leucadendron, 397
Melanthaceæ, 45, 92
Melia Azedarach, 342
Melissa officinalis, 479
Mella, honeys, 20
Menispermaceæ, 46, 206
Menispermine, 212
Menispermum canadense, 206, 209
Menispine, 207
Mentha aquatica, arvensis, canadensis, crispa, glabrata, longifolia, officinalis, piperascens, piperita, Pulegium, rotundifolia, sativa, spicata, sylvestris, viridis, vulgaris, 478, 482, 484, 486
Menthol, 485, 486, 783
Menthone, menthene, 478, 485, 486
Menyanthes trifoliata, 455
Menyanthin, menyanthol, 455
Mercury, hydrargyrum, 721
  ammoniated, 724
  bichloride, 724
  biniodide, 725
  corrosive chloride, 724
  cyanide, cyanuret, 728
  mild chloride, 727
  peroxide, 728
  protoiodide, 723
  red iodide, 725
    oxide, 727
    sulphide, 729
  subsulphate, 723
  with chalk, 676, 722
  yellow iodide, 723
    oxide, 725
Mescale, 392
Mesit, 70
Messenna, mussena, muserin, 361
Meta-cresalol, 798
  -cresol, 785
Methacetin, 792
Methol, 70
Methozine, 803
Methyl acetanilid, 792
  benzoyl-ecgonine, 320
  chavicol, 403
  chloride, 772
  conine, 419
  eugenol, 403
  green, 820
  pyrocatechin, 788
  salicylate, 144, 431, 432, 433, 797
  theobromine, 386, 387, 519
  tri-bromide, tri-chloride, tri-iodide, 773, 774
Methylal, 780
Methylamine, 65, 519
Methylene bichloride, 773
  blue, 773
  ditannin, 777
Methysticum Methysticum, 140

Metroxylon Rumphii, Sagu, 82, 88
Mezereum, mezereon, mezerein, 393
Micrometer, 816, 817
Microscope, accessories, 807, 815
  directions for using, 814
  in the drug store, 821–825
  magnification of, 819
  requisites of, 812
  simple, compound, 807, 808
Microscopic clearing, hardening, mounting, softening, staining, 819, 820, 821
Milfoil, 570
Milkweed, common, swamp, 464, 465
Mimosaceæ, 47, 267
Mistura, misturæ, mixtures, 20
  cretæ, 676
  ferri comp., 253, 345, 636, 690, 700
  glycyrrhizæ comp., 270, 304
  oleoso balsamica, 293
  rhei et sodæ, 171, 172, 486, 655
Mitchella repens, 538
Molasses, melasses, 85
Momordica Balsamina, 549
Monarda punctata, 477, 481
Monkshood, 193
Monochloral antipyrine, 805
Monocotyledones, 44, 78
Moonseed, Canadian, 206
Moraceæ, 46, 157
Moringa pterygosperma, 518
Morphine, 228
  acetate, hydrochlorate, sulphate, 228, 229, 232
Morrhuine, 597
Morus rubra, 158
Moschus moschiferus, 604
Moss Ceylon, 54
  Corsican, 54
  Iceland, 60
  Irish, 51
Mother cloves, 400
Motor-depressants, 36
  -excitants, 36
Mucilage acacia, 270
  chondrus, 53
  elm, 156
  quince, 267
  sassafras pith, 216
  tragacanth, 297
Mucilago, mucilagines, mucilages, 20
Mucuna pruriens, 312
Mugwort, 576
Mulberry, red, 158
Mullen, great, 512, 516
Muscarine, 59
Musk, Canton, Tonquin, etc., 604, 606
Mustard, black, French, Indian, leaves, Russian, white, wild, 238, 239, 241, 241
Mycoderma aceti, 752
Mycose, 56
Mydriatics, 36
Mylabris cichorii, phalerata, 592
Myosin, 546
Myotics, 36
Myrcene, 403
Myrcia acris, 403
Myricin, 594
Myristica fatua, fragrans, 182, 184
Myristicaceæ, 46, 182
Myristicin, myristicol, 184
Myrosin, 239, 240, 263, 266
Myroxocarpin, 293
Myroxylon peruiferum, 291, 295
  punctatum, 295
Myrrha, myrrh, 343
Myrrhol, myrrhenol, myrrhin, 344
Myrtaceæ, 49, 397

NAPELLINE, 194
Napht(h)alin, 70, 766, 800
Naphthyl-benzoate, 800
Naphtol, 766, 800
Naphtol-aristol, 801
Naphto-salol, 798
Narcotics, 35
Narcotine, narceine, 228, 230
Nardostachys Jatamansi, 545
Nardus indica, spica celtica, 545
Narthex assafœtida, 424
Nat-aloin, 101, 102
Natural orders (families), 42, 44
Nebulæ, sprays, 22
Nectandra Rodiœi, 208, 224
Nepeta Cataria, var. citriodora, 475, 479
Nerole bigarade, petale, petit grain, Portugal, 333, 337
Nerolol, 333
Nerolyl acetate, 333
Nervines, 35
Nettle stinging, 160
Neurotics, 35
Nicotiana Persica, quadrivalvis, repanda, rustica, Tabacum, 505, 507
Nicotine, nicotianin, 506
Night-blooming Cereus, 392
Nitrobenzene, nitrobenzol, 265
Nitrogen, 617
Non-pharmacopœial organic carbon compounds, 769
Nopalea cochenillifer, 586
Nose-piece, 811, 812, 813
Nucin, juglone, 141
Nutgall, 149
  American, Chinese, Japanese, 153
Nutmeg, California, false, male, wild, 182, 184
Nux vomica, 448

OAK, barren, black, blackjack, chestnut, cork, English, iron, live, scarlet, Spanish, white, etc., 145, 146
Oak-red, 147, 148
Oatmeal, 86
Objectives, 810
Oculars, 808, 810
Oculina virginea, 588
Ocymum Basilicum, 488
Oil almond bitter, 264
    expressed, 266
  amber, 74
  anise, 180, 414
  anthemis, 569

Oil balæna, 598
  ben, behen, 518
  benne, 516
  bergamot, 338, 339
  betula volatile, 144, 431
  birch empyreumatic, 144
  black pepper, 138
  cade, 76
  cajuput, 397, 398
  camphor, 224
  caraway, 416
  carron, 673
  castor, 354
  ceti, 598
  chenopodium, 176
  cinnamon, 219
  cloves, 400
  cocoanut, 89
  cod-liver, 596, 603
  copaiba, 286
  coriander, 417
  cotton seed, 381, 382, 383
  croton, 349
  cubeb, 134
  ergot, 56
  erigeron, 563
  ethereal, 758
  eucalyptus, 405
  fennel, 411
  fleabane, 563
  fusel, 743
  gaultheria, 431, 432
  geranium, Turkish, 253
  ground nut, 517
  hedeoma, 477
  horse mint, 477
  hyssop, 480
  juniper, 74, 75
  lard, 602
  lavender flowers, 487, 488
  lemon, 337
  linseed, boiled, 316, 318
  mace, 184
  maize, 80
  matricaria, 571
  meadow-sweet, 143
  melissa, 479
  mirbane, 265
  mustard volatile, 240
  myrcia, bay, 403
  neroli, 333
  nutmeg, volatile, expressed, 184
  olive, 439, 440
  orange flowers, 332
    peel, 335
  origanum, 480
  palm, 89
    seed, 310
  peppermint, 484
  petit grain citronnier, 337
  phosphorated, 628
  pimenta, 402
  ray, raja, 598
  rose, 252
  rosemary, 489
  roshé, rusa, 253
Oil rusci, 144
  santal, 164, 165
  sassafras, 215
  savine, 76, 77
  sesamum, 516, 517
  shark, skate, 598
  soy, 517
  spearmint, 483
  sperm, 598
  squali, 598
  sweet birch, 144
  tambor, 357
  tansy, 574
  tar, 70
  teel, 516
  theobroma, 385
  thyme, 480
  turpentine, 67, 68
    rectified, 68
  valerian, 544
  vitriol, 625
  whale, 598
  wintergreen, 431, 432
    artificial, 432, 797
Ointment, unguentum, 594, 602
  ammoniated mercury, 725
  basilicon, 69
  belladonna, 497
  blue, 822
  boric acid, 623
  carbolic acid, 762
  chrysarobin, 308
  delphinine, 192
  diachylon, 441, 711
  Hebra's, 711
  iodine, 634
  iodoform, 750
  lead carbonate, 711
    iodide, 714
  mercury, 608, 722
  nutgall, 151
  phytolacca, 179
  picrotoxin, 212
  potassium iodide, 648
  red mercuric oxide, 728
  rose-water, 253, 267, 594, 601
  savine, 77
  staphisagria, 192
  storax, 246
  stramonium, 504
  sulphur, 624
  tannic acid, 152
  tar, 70, 594
  thymol, 481
  veratrine, 96
  white precipitate, 725
  yellow mercuric oxide, 726
  zinc oxide, 709
Ointments, unguenta, 21
Old man, 575
Olea europæa, 439
Oleaceæ, 49, 439
Oleate aconitine, 195
  cocaine, 321
  mercury, 726
  morphine, 232

Oleate veratrine, 96
Oleat-um, a, oleates, 20
Olein, 608
Oleoresin aspidium, 63, 257
  capsicum, 494
  cubeb, 136
  ginger, 127
  lupulin, 161
  pepper, 138
Oleoresin-a, æ, oleoresins, 20
Ole-um, a, oils, 20
Olibanum, olibene, 345, 368
Olive, olein, 439, 440
Omphalea oleifera, 357
Onion, 98
Ononis spinosa, 305
Opium, Abkari, Asia Minor, Boston, Chinese, deodorized, Egyptian, factitious, French, granular, homogeneous, Indian, Persian, Provision, Trebizond, Turkey, 225, 226, 227, 228, 231
  habit, test, 233, 234
Opopanax Chironium, Opoponax, 428
Opuntia cochinillifera, 586
Orange-peel, bitter, sweet, 332, 334
Orchidaceæ, 45, 129
Orchil, 61
Orchis mascula, 133
Oregon balsam of fir, 72
Orexine hydrochloride, 802
Organic bases, 801
  carbon compounds, 737
Origanum vulgare, Majorana, 480
Orizabin, 469
Orthoform, 800
Oryza sativa, 81
Osmunda regalis, 64
Os sepiæ, 588
Ostrea edulis, virginiana, 588
Otolithus regalis, 595
Ourouparia Gambier, 273
Ovis Aries, 608
Oxgall, 610
Oxyacanthine, 200
Oxyatropine, 497
Oxy-conine, 419
Oxygen, 615
Oxymella, oxymellita, 22, 593
Oxy-quin-aseptol, 802
Oxytocics, 40
Oystershell, 588

PACHYDERMATA, 601
Palaquium Gutta, oblongifolium, 435
Palmaceæ, 88
Palmitin, 608
Panax quinquefolium, 166, 407
Pancreatin, 601, 602
Pansy, 391
Papain, papayotin, papaw, papoid, 604
Papaveraceæ, 46, 225
Papaverine, 228
Papaver Rhœas, somniferum, var. album, glabrum, nigrum, 225, 234
Paper, mustard, 240, 349
  potassium nitrate, 649
Papers, 19
Papier mouri, 341
Papilionaceæ, 47, 290
Para-acetanisidin, 792
  -acetphenetidin, 793
  -brom-acetanilid, 791
Paracotoin, 225
Para cresalol, 798
Para-cresyl-benzoate, 785
Paraffin, 70
Paraguay tea, 388
Para-iodo-acetanilid, 792
Paraldehyde, 745, 777
Paramenispermine, 212
Para-oxy-metamethoxyallyl benzol, 401
Parasiticides, 35
Pareira brava, 207
Parillin, pariglin, 115
Parmeliaceæ, 44, 59
Parsley, common, garden, 416
  fools, 421
Partridgeberry, 538
Parvules, 22
Pasque flower, 197
Paste, 22
Pastilles, 22
Paullinia Cupana, sorbilis, 371, 520
Paytine, 530
Peach, 267
Pearl-white, 717
Pectinose, 270
Pedaliaceæ, 50, 516
Pelargonium capitatum, odoratissimum, Radula, 253
Pelletierine, iso, methyl, pseudo, 396
Pellitorine, 573
Pellitory, German, Persian, 572, 573
Pellotine, 392
Pelosine, 208
Pencils, 21
Pennyroyal, American, European, 477, 478
Pental, 772
Pepo, 545
Pepper, African, black, Cayenne, long, white, 136, 138, 492
Peppermint, 484
  tree, 407
Pepsin, saccharated, 601, 603
Persimmon, 436
Petrolatum liquidum, molle, spissum, 739
Petroleum-benzin, 738
Peucedanum graveolens, 415
  Ostruthium, 194
Phæoretin, 170, 171, 279
Phanerogamia, 66
Pharmacodynamics, 17
Pharmacognosy, 17
Pharmacology, 17
Pharmacopœia, 18
Pharmacy, 17
Phaseolus vulgaris, 81
Phaseo-mannit, 85
Phellandrene, 126
Phenacetin, 793
Phenazone, 803

Phenocoll hydrochloride, 795
  salicylate, 795
Phenols, 70, 783
Phenylbenzamid, 794
Phenylethelene, 245
Phenyl formamide, 791
  urethane, 781
Phenylpropyl cinnamate, 211
Phloroglucin, 63, 273
Phloroglucol, 249
Phlox carolina, glaberrima, 447, 448
Phosphorus, 627
Physeter macrocephalus, 598, 600
Physetoleïn, 597
Physical agents, 18
Physostigma cylindrospermum, venenosum, 309
Physostigmine, eserine, 310
  salicylate, sulphate, 310
Phytolacca acinosa, decandra, octandra, 177, 179
Phytolaccaceæ, 46, 177
Phytolaccin, phytolaccine, 178
Phytosterin, 244, 311
Picea succinifera, 73
Pichi, 505
Picraconitine, 195
Picrasma excelsa, 340
Picrasmin, 341
Picrocrocin, 120
Picropodophyllin, 202
Picro-sclerotine, 57
Picrotin, 212
Picrotoxin, 211, 212
Pieree divine, ophthalmique, 715
Pigweed, 177
Pills aloes, 102
    and asafetida, 102, 424
    and iron, 102, 103, 690
    and mastic, 103, 251, 368
    and myrrh, 103, 344
  antimony comp., 324, 727, 733
  asafetida, 424
  Blaud's, 701
  blue, 722
  cathartic comp., 391, 468, 549, 727
  ferrous carbonate, 380, 636, 690, 701
    iodide, 304, 689
  galbanum comp., 424
  lupulin, 161
  opium, 231
  Plummer's, 733
  phosphorus, 380, 628
  rhubarb, 172
    comp., 103, 172, 345, 486
  vegetable cathartic, 468, 509, 549
Pilocarpine, pilocarpidine, 328
  acetate, hydrobromate, hydrochlorate, nitrate, phosphate, 328
Pilocarpus grandiflorus, heterophyllus, Jaborandi, microphyllus, pauciflorus, pinnatifolius, Selloanus, spicatus, trachylophus, 327, 329
Pilul-a, æ, pills, 20
Pimenta acris, officinalis, Pimenta, 401, 403
Pimpinella Anisum, 413
Pinaceæ, 44, 66
Pine, Frank-incense, Loblolly, old-field, Wild, 71
Pinene, 68, 73, 75, 77
Pinites succinifer, 73
Pink, Carolina or Georgia, 447, 448
Pinus australis, Laricio, maritima, palustris, Pinaster, rigida, rotundata, sylvestris, Tæda, 66, 70, 71
Piper aduncum, album, angustifolium, Betle, caninum, carpunya, citrifolium, crassipes, Cubeba, Jaborandi, lanceæfolia, Lowong, Methysticum, Mollicomum, nigrum, officinarum, peltatum, reticulatum, ribesoides, umbellatum, unguiculatum, 134, 136, 138, 139, 140, 328
Piperaceæ, 45, 133
Piperazine, 801
Piperin, piperidine, 137, 138
Piperonal, 138
Pipsissewa, 429, 430, 434
Pisces, 594
Piscidia Erythrina, 299
Pistacia cabulica, Khinjuk, Lentiscus, mutica, Terebinthus, 71, 367, 369
Pitch, Burgundy, 72
  Canada, hemlock, 74
Plasmodium malariæ, 536
Plaster adhesive, 69
  ammon. and merc., 427, 428, 711, 722
  arnica, 69, 579
  belladonna, 69, 497
  Burgundy pitch, 73, 441
  Canada pitch, 71
  cantharidal pitch, 73, 590
  capsicum, 69, 494
  iron, 73, 441, 711
  isinglass, 595
  lead, 441, 711
  mercury, 711, 722
  opium, 73, 231, 711
  Paris, 678
  pepper, 138
  resin, 69, 594, 711
  soap, 441, 711
Plasters, 19
Platinic chloride, 736
Platinum, 736
Plumbum, lead, 710
Podophyllin, podophyllotoxin, 202, 203
Podophyllo-quercetin, 202
Podophylloresin, 202
Podophyllum Emodi, 203
  peltatum, 201
Pogostemon Heyneanus (Patchouli), 479
Poison ivy, 365
Poisons, treatment, antidotes, 827
Poke-root, 177
Polemonium reptans, 166
Polychroit, 120
Polygala alba, amara, Boykinii, polygama, rubella, Senega, 346, 348
Polygalaceæ, 48, 345
Polygalin, 347

Polygonaceæ, 46, 168
Polygonatum commutatum, giganteum, multiflorum, 108
Polygonum Bistorta, 175, 313
Polypodiaceæ, 44, 61
Polypodium vulgare, 64
Polyporus fomentarius, 59
    officinalis, 59
Pomegranate, rind, 395, 396
Poppy, 234
    seed, 234
    yellow horned, 238
Populus acuminata, alba, angustifolia, tremula, 143
Porteranthus stipulatus, trifoliatus, 256
Potassa, 637
    sulphurated, 636, 638
    with lime, 638, 673
Potassium, kalium, 635
    acetate, 639
    acid sulphate, 240
    and sodium tartrate, 641
    bicarbonate, 637
    bichromate, 645
    bitartrate, 377, 640
    bromide, 647
    carbonate, 636
        impure, 636
    chlorate, 642
    citrate, 639
        efferves., 640
    cyanide, 643
    ferrocyanide, 644
    hydrate, hydroxide, 655
    hypophosphite, 643
    iodide, 648
    myronate, 240
    nitrate, 649
    permanganate, 649
    sulphate, 646
    sulphite, 640
    tartrate, 642
Potato-fly, 591
Potentilla canadensis, Tormentilla, 249, 313
Potter's table of incompatibles, 28
Poultices, 21
    hops, 160
Powder aloes and canella, 103, 391
    antimonial, 733
    aromatic, 123, 127, 220
    bleaching, 674
    catechu comp., 301
    chalk comp., 270, 676
    dalmatian insect, 573
    effervescing comp., 641, 655
    glycyrrhiza comp., 280, 304, 412, 624
    goa, 307
    insect, 553
    ipecac and opium, 231, 523
    jalap comp., 468
    James', 733
    kino comp., 301
    morphine comp., 223, 232, 304
    Persian insect, 573
    rhubarb comp., 127, 172
    seidlitz, 641, 655
Premna traitensis, 91
Prescription writing, 838
Prickly ash, 325
    poppy, 234
Pride of India, 342
Prinos verticillata, 370
Prophetin, 551
Prosopis juliflora, 269
Protectives, 41
Protokosin, 256
Protopine, 235, 236, 237
Protoveratrine, protoveratridine, 94
Prune de St. Julian, 262, 263
Prunella vulgaris, 475
Prunus Amygdalus, var. Juliana, domestica, var. amara, dulcis, Laurocerasus, obovata, Persica, rubra, serotina, virginiana, 260, 261, 263, 265, 267
Prussiate of potash, 654
Pseudaconitine, 195
Pseudo-conydrine, 419
    -jervine, 92, 94
    -morphine, 228
Psychotria emetica, 525
Ptelia trifoliata, 365
Pteridophyt(es)-a, 44, 61
Pterocarpin, 298
Pterocarpus erinaceus, Marsupium, santalinus, 298, 299
Ptychotis Coptica, 481
Pulegone, 478
Pulicaria dysenterica, 265
Pulmonary sedatives, 36
Pulsatilla, pasque flower, 197
    hirsutissima, pratensis, Pulsatilla, 198
Pulvis, pulveres, powders, 20
Pumpkin-seed, 545
Punica Granatum, 395
Punicaceæ, 49, 394
Punicine, 396
Purgatives, cholagogue, drastic, hydragogue, saline, simple, 38, 39
Purging cassia, 274
Purple avens, 249
Purshianin, 376
Pustulants, 41
Pyrene, 70
Pyrethrin, pyrethrine, 573
Pyrethrum carneum, Parthenium, roseum, Tanacetum, 569, 572, 573, 574
Pyrocatechin, -catechol, 70, 300, 301, 344
Pyrodin, 795
Pyrogallol, 152, 249, 791
Pyroguaiacin, 324
Pyrola chlorantha, elliptica, rotundifolia, umbellata, 429, 430
Pyrolaceæ, 49, 429
Pyroligneous spirit, alcohol, 776
Pyroxylin, 383
Pyrus Cydonia, Malus, 267

QUASSIA amara, excelsa, Simaruba, 340, 341, 342
Quassin, 341
Quebrachin, quebrachit, quebrachamine, 461

Quebracho Colorado, flojo, 460, 461
Queen of the Meadow, 561
Quercetin, 148, 273
Quercin, 147, 148
Quercitron, quercitrin, 149, 250, 251
Quercus Ægilops, alba, coccifera, coccinea, var. tinctoria, digitata, falcata, ferruginea, lobata, lusitanica, marylandica, nigra, pedunculata, Prinus, pubescens, Robur, sessiliflora, suber, Vallonea, velutina, virens, virginiana, 145, 146, 147, 148, 149, 153, 444, 587
Quevenne's iron, 686
Quicksilver, 721
Quillaia-sapotoxin, 254
Quillain, 255
Quillaja Saponaria, 253
Quinamine, quinamicine, quinicine, 530, 534
Quince, 267
Quinidine, sulphate, 530, 532
Quinine, bisulphate, hydrobromate, hydrochlorate, sulphate, valerianate, 530, 531
  flower, 454
Quino-quino tree, 295
Quinol, 790
Quinovin (kinovin), 530, 534

RADISH, garden, wild, 242
Raja Batis, 598
Ranunculaceæ, 46, 185
Ranunculus bulbosus, 199
Rape, 241
Raphanum raphanistrum, 242
Raspberry, 247
Rectal medication, 24
Red ant, 592
  lead, 712
  precipitate, 727
  saunders, 298
Refrigerants, 37
Remigia Purdieana, 537
Renfer, 603
Resin, 67, 68
  carana, 323
  copaiba, 287
  guaiac, 323
  jalap, 468
  Kouri, 74
  podophyllum, 202, 203
  scammony, 471
  sumbul, 426
Resina, resin, 67, 68
Resino-tannol, 293, 424
Resorcin, resorcinol, 764, 790
Respiration, 24
Respiratory sedatives (depressants), 36
  stimulants, 36
Rest-harrow, 305
Restoratives, 33
Rhamnaceæ, 48, 372
Rhamnocathartin, 374
Rhamnose, rhamnin, rhamnetin, 373, 374, 376
Rhamnoxanthin, 373
Rhamnus californica, caroliniana, cathartica, Frangula, Purshiana, 134, 372, 374, 375, 376
Rhaphidophora vitiensis, 91
Rhatanic-red, 289
Rhatany, Payta, Peruvian, Savanilla, etc., 288
Rheïn, 170
Rheum australe, compactum, Emodi, hybridum, officinale, palmatum, rhaponticum, undulatum, 168, 170, 173
Rhizomes, 31
Rhodinol, 252
Rhœadine, 234
Rhubarb, Chinese, crown, European, E. Indian, Russian, torrefied, 168, 170, 173
Rhus aromatica, copallina, Coriaria, diversiloba, glabra, hirta, japonica, pumila, radicans, semialata, Toxicodendron, typhina, venenata, vernix, 153, 364, 365, 367
Richard(son)ia scabra, 525
Ricin, ricinin, 354
Ricinolein, 354
Ricinus communis, 354
Rigolene, 740
Rochelle salt, 641
Rock candy, 85
Root alum, 246
  arrow, 81, 124
  blood, 234
  colic, 129
  Culver's, 508
  Demerara pink, 448
  fever, 542
  gravel, 561
  liquorice, 301
  man, Mechoacanna, 469
  pink, 446
  pleurisy, 464
  queen's, 357
  stone, 488
Roots, radices, 31
Roripa Armoracia, 241
Rosa blanda, canina, centifolia, damascena, gallica, nitida, 250, 252
Rosaceæ, 47, 247
Rose, Damascus, dog, pale, red, 250, 252
Rosemary, 489
  marsh, 435
Rosin, 67, 68
Rosmarinus officinalis, 489
Rottlera, rottlerin, 359, 360
Rubefacients, 40
Rubia tinctorium, 525
Rubiaceæ, 50, 518
Rubijervine, 92, 94
Rubreserine, 310
Rubus canadensis, fruticosus, Idæus, occidentalis, strigosus, trivialis, villosus, 247, 248
Rules modifying doses, 26
Rumex Acetosella, aquaticus, britannica, crispus, obtusifolius, sanguineus, 173, 174

Rumicin, 173
Ruminantia, 604
Rusbyine, 343
Ruta graveolens, 332
Rutabaga, 241
Rutaceæ, 47, 325
Rutin, 331

SABADILLA, cevadilla, 95
  Sabadine, sabadinine, 95, 96
Sabbatia angularis, campestris, Elliottii, 454
Sabina, savine, 76
Saccharin, 797
Saccharomyces cerevisiæ, 58
Saccharum, crystallizatum, hordeatum, lactis, 85, 610
  officinarum, 82
Safflower, 582
Saffron, 119
Safrol, 180, 181
Sage, 475
Sago, 82, 88
Sagus Rumphii, 88
Salacetol, salophen, 798, 799
Salep, 133
Salicaceæ, 45, 142
Salicin, 142, 143
Salicylic aldehyde, 143
Salicylism, 433
Saligenin, 143
Salinaphtol, 798
Salipyrine, 804
Saliretin, 143
Salix alba, fragilis, purpurea, 143
Salocoll, 795
Salol, 765, 798
Sal-prunelle, 649
Salseparin, 115
Salt common, table, 653
  of lemon, sorrel, 754
Saltpetre, 649
Salvia lyrata officinalis, polystachya, pratensis, 475, 477
Salviol, 476
Sambucus canadensis, Ebulus, maderensis, nigra, 538, 539
Sandalwood, Venezuela, 165
  white, 164
Sandarac, 74, 368
Sand-myrtle, 434
Sanguinaria canadensis, 234, 313
Sanguinarine, 235, 237
Sanguis, 611
Sanguisuga medicinalis, officinalis, 588
Santalaceæ, 46, 164
Santalal, santalol, 165
Santalene, 165
Santalin, santal, 298
Santalum album, austro-caledonicum, Freycinetianum, pyrularium, Yasi, 164, 165
  rubrum, 298
Santonica, santonin, 576, 577
Sap green, 374
Sapindaceæ, 48, 370, 520
Sapogenin, 347
Saponin, 115, 116, 200, 254, 347
Sapotaceæ, 435
Sarepta, 241
Sarsaparilla, 112
  false, Virginian, wild, 407
  German, 116
Sarsa-saponin, 115, 116
Sassafras (lignum) wood, pith, Sassafras, 214, 215, 216
  variifolium, 214
Sassafrid, 215, 216
Satin-wood, 326
Scabiosa arvensis, succisa, 543
Scales, 22
Scammony, scammonin, 467, 469
  factitious, 470
Schœnocaulon officinale, 95
Scilla, squill, 98
Scillain, 99
Scillapicrine, scillamarine, scillinine, 99
Scillin, scillitoxin, 99
Scillitin, scillipicrin, 99
Sclererythrin, scleroiodin, 57
Sclerocrystallin, 57
Scleromucin, 57
Scleroxanthin, 57
Scoparius, scoparin, 305, 306
Scopolamine, 498, 499, 501, 504
Scopoletin, 496, 498
Scopolia atropoides, carniolica, japonica, 495, 498
Scopolina atropoides, 498
Scorodosma fœtidum, 421
Scotch fir, 71
Scrophulariaceæ, 50, 507
Scrophularia nodosa, 509
Scutellaria galericulata, integrifolia, lateriflora, pilosa, 473, 474, 541
Scutellarin, 473
Secale cereale, 54
Secaline, 58
Secalintoxin, 57
Sedatin, 794, 803
Sedatives, 35
Seed Chia, 477
Seeds, 32
Self-heal, 475
Semen quercus tostum, 149
Semi-alteratives, 34
Senega, 346
  false or white, 348
Senegin, 347
Senna, Alexandria, India, etc., 275, 277
Sennapicrin, sennacrol, sennit, 279
Sepia officinalis, 588
Serpentaria, 166
Serronea Jaborandi, 328
Sesamum indicum, 516
Sevum, suet, 608
  bovinum, 609
Sheep sorrel, 175
Shikimi, 180
Shin-leaf, 420
Sialagogues, sialogogues, 37
Sidhee, siddhi, subjee, 163

Silicon, silicium, 622
Silkweed, 465
Silky cornel, 429
Silver, argentum, 718
    cyanide, 720
    iodide, 720
    nitrate, diluted, 718, 719
        moulded, 719
    oxide, 721
Silybum fructus, marianum, 582
Simaba cedron, ferruginea, 342
Simaruba amara, excelsa, medicinalis, officinalis, 341, 342
Simarubaceæ, 48, 339
Sinalbin, sinigrin, 239, 240
Sinapine, sulphate, sulpho-cyanide, 239, 240
Sinapis alba, nigra, 238
Sinistrin, 99
Sinkaline, 240
Sium latifolium, 543
Skullcap, 473
Skunk cabbage, 91
Slippery-elm, 156
Smilaceæ, 45, 112
Smilacin, 115
Smilacina racemosa, 108
Smilax aspera, china, glauca, medica, officinalis, ornata, papyracea, pseudo-china, syphilitica, tamnoides, 112, 113, 114, 115, 116
Snake-head, 509
Snakeroot, button, 413
    Virginia, 166
Soap, soft, 317, 441
Soc-aloin, 101, 102
Soda, 655
Sodium, natrium, 650
    acetate, 656
    arsenate, 660
    benzoate, 657
    bicarbonate, 654
    bisulphite, 657
    borate, 651
    bromide, 659
    carbonate, 653
        dried, 654
    chlorate, 661
    chloride, 653
    di-thio-salicylate, 798
    hydrate, hydroxide, 655
    hypophosphite, 658
    hyposulphite, 658
    iodide, 659
    nitrate, nitrite, 651, 652
    paraphenol-sulphonate, 662
    phosphate, 661
    pyrophosphate, 662
    ricinoleate, 356
    salicylate, 660
    santoninate, 577, 656
    sulphate, 662
    sulphite, 657
    sulphocarbolate, 662
    thiophene sulphonate, 783
    thiosulphate, 658
Soja hispida, 305, 517
Solanaceæ, 50, 490
Solanine, solanidine, 490, 491
Solanum carolinense, Dulcamara, nigrum, paniculatum, tuberosum, 81, 490, 492, 495
Solenostemma Argel, 276, 277
Solidago odora, 563
Solomon's seal, American, European, false, 108
Solution boric acid, 623
    boroglyceride, 623
    decinormal oxalic acid, 754
    Donovan's, 725
    elaterium, 551
    Fowler's, 730
    hydrogen di(per)oxide, 616
    Magendie's, morphine, 232
    Monsel's, 691
    nitroglycerin, 744
    Pearson's, 661
    platinic chloride, 736
    Labarraque's, 674
Somnal, 782
Somnificants, 35
Soporifics, 35
Sorghum vulgare, var. saccharatum, 82, 88
Sozoiodol, 784
Spanish-flies, 589
Sparteine, sulphate, 306
Spartium junceum, 307
Spearmint, 482
Species, 43
    lexantes St. Germain, 280
Speedwell, common, 509
Spermaceti, 600
Spermatophyt(es)-a, 44, 66
Sphacelotoxin, 57
Sphærococcus lichenoides, 54, 596
Spice bush, 225
    tree, 216
Spigelia anthelmintica, marylandica, 166, 446
Spigeline, 447
Spikenard, 512, 545
Spinants, 36
Spindle tree, 370
Spiræa tomentosa, 255
    Ulmaria, 143
Spirit ammonia, aromatic, 338, 617, 618
    anise, 414
    asafetida ammoniated, 424
    bitter-almond, 265
    camphor, 223
    chloroform, 748
    cinnamon, 220
    ether, 758
        comp., 758
    gaultheria, 433
    glonoin, 744
    hartshorn, 617
    hedeoma, 478
    juglans, 141
    juniper, comp., 75, 412, 416
    lavender, 488
    lemon, 337, 338

Spirit melissa, 479
    myrcia, 336, 403, 404
    nitroglycerin, 744
    nitrous ether, 652, 759
    nutmeg, 184
    orange, comp., 335, 336, 338, 414, 418
    peppermint, 486
    phosphorus, 628
    salt, 631
    spearmint, 483
Spiritus, spirits, 20
Spiritus frumenti, 741
    vini gallici, 742
Sponge, burnt, vegetable, wash-rag, 549, 587
Spongia officinalis, usta, 587
Sprays, 22
Spurge, Flax, flowering, ipecac, Laurel, 358, 359, 393
Squalus Carcharias, 598
Squaw vine, 538
Squill, scilla, 98
Squirting cucumber, 550
Stagshorn, 607
Staphisagria, stavesacre, 191
Staphisagrine, staphisaine, 192
Staphisagroine, 192
Starch corn, bean, cassava, cucumba, euphorbia, oat, potato, rice, sago, sarsaparilla, tapioca, 78, 79, 81, 82
Starwort, 129
Statice, Limonium var. caroliniana, 435
Steapsin, 603
Stearin, 608
Sterculiaceæ, 48, 385
Sternutatories, 37
St. Ignatius' bean, 452
Stilbene, 293
Stillingia sebifera, sylvatica, 357, 358
Stimulants, 35
Storesin, 245
Storksbill, 313
Stramonium, 502
Strawberry bush, 370
Strontium, bromide, 680, 681
    iodide, 681
    lactate, 681
Strophanthin, 458
Strophanthus dichotomus, false, hispidus, Kombé, 457, 460
Strychnine, hydrochlorate, nitrate, phosphate, sulphate, etc., 449
Strychnos Castelnæana, colubrina, Ignatia, Nux vomica, potatorum, Tieute, toxifera, 448, 452
Sturiones, 594
Styptics, 41
Styracaceæ, 49, 436
Styracol, 789
Styrax, storax, 244
    Benzoin, 436
    calamita, officinalis, 246
Styrol, styracin, 293
Suberin, 149
Succinum, 73
Succ-us, i, juices, 22
Sucrol, 782
Sudorifics, 39
Suet, 608
Sugar, 82, 84, 85
    barley, 85
    beet, 82
    cane, 82
    fruit, 85
    grape, 84
    of lead, 712
    of milk, 610
    starch, 84
Sulphaminol, 784
Sulphonal, 779
Sulphur, lotum, præcipitatum, sublimatum, 623, 624
Sumach, black, dwarf, European, staghorn, sweet-scented, 364, 365
Sumbul, 425
    false, 426
Suppositori-um, a, suppositories, 20
Surinam quassia-wood, 342
Sus scrofa, 601
Sweet bay, 225
    flag, 89
    gum, 246
    scabious, 564
    spirit of nitre, 652, 759
Swertia angustifolia, Chirayita (Chirata), pulchella, 454, 455
Sycocarpus Rusbyi, 343
Sylvacrol, 357. 358
Symphytum officinale, 512
Symplocarpus fœtidus, 91, 92
Synaptase, 264
Synthetic remedies, 769
Syrup acacia, 84, 270
    almond, 264, 265, 266, 267
    althæa, 380
    calcium lacto-phosphate, 678, 757
    cimicifuga comp., 191
    cinnamon, 221
    citric acid, 756
    corn silk, 80
    Cox's hive, 100
    erodictyon, 472, 473
    ferrous iodide, 688
    garlic, 97
    ginger, 127
    glycyrrhiza, 305
    guarana, 372
    hydriodic acid, 635
    hypophosphites, 643, 677
        with iron, 643, 689
    ipecac, 523
    krameria, 290
    lactucarium, 559
    lemon juice, 338
        peel, 338
    lime, 673
    matricaria, 571
    orange, 335
        flowers, 334
    peppermint, 486
    phosphate iron quinine and strychnine, 535, 695

- Syrup quassia, 126
  - quillaja, 254
  - raspberry, 247
  - rhubarb, 172
    - aromatic, 172
  - rose, 251
  - rubus, 249
  - sarsaparilla, comp., 116, 216, 280, 304, 433
  - senega, 347
  - senna, 280, 418
  - spearmint, 484
  - squill, comp., 99, 100, 347, 414, 734
  - stillingia, comp., 358
  - tar, 70
  - Tolu, 295
  - wild cherry, 262
- Syrup-us, i, syrups, 20

- TABLE comparing metric and apothecaries' fluid measure, 841
    - avoirdupois, apothecaries' weights, 841
  - constituents, 853
  - corresponding values, 841
  - doses of rare drugs, 843
  - drops in fluidrachms, 845
  - Fahrenheit and Centigrade equivalents, 848
  - maximum doses, 842
  - measures of approximation, 842
  - medical abbreviations, 848–852
  - weight of fluidrachms, in grains and grammes, 845, 847
    - liquids, 842
- Tablets, 22
  - triturates, 22
- Tænifuges, 40
- Tagetes erecta, patula, 568
- Talc(um), 672
- Tallow, beef, 609
- Tamar Indien, 282
- Tamarindus indica, 281
- Tamarisk galls, 153
- Tamarix africana, articulata, gallica, mannifera, orientalis, 153, 444
- Tanacetin, tanacetone, 574
- Tanacetum Balsamita, crispum, vulgare, 574
- Tannin, tannic acid, 150
- Tannoform, 777
- Tansy, double, 574
- Tapioca, 82, 357
- Tar, 70
- Taraxacin, taraxacerin, 556
- Taraxacum officinale, Taraxacum, 555
- Tartar emetic, 733
- Taurin, 610
- Tea, cotton-seed, 384
- Teleostia, 596
- Tephrosia Apollinea, 277
- Terebene, 68, 69, 783
- Terminalia angustifolia, 438
- Ternstrœmiaceæ, 48, 387
- Terpin hydrate, 68, 69, 783
- Terpinene, 123
- Terpineol, 123
- Terpinyl acetate, 73
- Terra japonica, 273
- Test Grahe's, 538
- Testa, ovi, 588, 599
- Tetronal, 780
- Thalline, 803
  - sulphate, tartrate, 803
- Thallochlor(ophyll), 60
- Thallophyt(es)-a, 44, 51
- Theaceæ, 48, 387, 518
- Thea drupifera, japonica, oleosa, sinensis, 387, 388, 518, 519
- Thebaine, 228
- Theine, 387, 388, 518, 519
- Theobroma Cacao, 385
- Theobromine, 385, 386, 806
  - sodio-salicylate, 387, 806
- Theophylline, 388
- Therapeutics, 18
- Thimbleberry, 247
- Thio-oxy-diphenylamine, 784
- Thiophene-di-iodide, 783
- Thioresorcin, 790
- Thiosinamin, 782
- Thorn-apple, entire-leaved, purple, 502, 505
- Thoroughwort, 560
- Thridace, 559
- Thuja occidentalis, 78
- Thujone, 476, 574, 575
- Thymacetin, 482
- Thyme, thymol, 480, 481
- Thymelæaceæ, 48, 392
- Thymene, 481
- Thymus vulgaris, 480, 481
- Thyroideum, thyroid, 609
- Tin, stannum, 735
- Tinctur-a, æ, tinctures, 21
- Tincture aconite, 195
    - Flemming's, 195
    - leaves, 195
  - aloes, 103, 304, 344
    - and myrrh, 103, 305
  - anamirta, 212
  - arnica flowers, root, 579, 580
  - asafetida, 424
  - aspidosperma, 461
  - belladonna, 497
  - benzoin, 439
    - comp., 103, 439
  - bitter-orange peel, 333
  - bryonia, 552
  - buchu, 331
  - calamus, 91
  - calendula, 568
  - calumba, 211
  - cantharides, 590
  - capsicum, 494
  - cardamom, 123
    - comp., 123, 220, 416, 587
  - cascarilla, 353
  - catechu comp., 220, 273
  - caulophyllum, 200
  - chirata, 455
  - chloride of iron, 687

Tincture Churchill's iodine, 634
  cimicifuga, 191
  cinchona, comp., 167, 334, 535
  cinnamon, 220
  cloves, 401
  coca, 321
  cochineal, 587
  colchicum seed, 111
  colocynth, 549
  conium, 420
  cubeb, 136
  cypripedium, 131
  decolorized iodine, 634
  digitalis, 515
  ergot, 57
  eucalyptus, 406
  fresh herbs, 198
  gelsemium, 446
  gentian comp., 123, 334, 454
  ginger, 127
  guaiac, 324, 617
    ammoniated, 324, 617
  guarana, 372
  hamamelis, 244
  hops, 160
  hydrastis, 187
  hyoscyamus, 501
  Indian cannabis (hemp), 162
  iodine, 634
  ipecac and opium, 231, 523
  jalap, 468
  kamala, 361
  kino, 301
  krameria, rhatany, 290
  lactucarium, 559
  lappa, 582
  lavender comp., 184, 220, 401, 488, 489
  leptandra, 509
  lobelia, 554
  lupulin, 161
    ammoniated, 161
  mace, 185
  matico, 139
  musk, 606
  myrrh, 344
  Dr. Norwood's, 94
  nutgall, 151
  nux vomica, 450
  opium, 230
    camphorated, 223, 231, 414, 439
    deodorized, 230, 231
  orange-peel, bitter, 333
    sweet, 335
  physostigma, 311
  phytolacca, 179
  pilocarpus, 328
  podophyllum, 203
  pulsatilla, Homœopathic, 198
  pyrethrum, 573
  quassia, 341
  quillaja, 254
  rhamnus Purshiana, 376
  rhubarb, 123, 172
    aromatic, 172, 184, 401
    sweet, 124, 172, 414
  rhus toxicodendron, 366
Tincture saffron, 120
  sanguinaria, 236
  savine, 77
  senega, 347
  serpentaria, 167
  squill, 100
  staphisagria, 192
  stillingia, 358
  stramonium, 504
  strophanthus, 458, 459
  sumbul, 426
  sweet-orange peel, 335
  Tolu, 295
  turmeric, 128
  valerian, 544
    ammoniated, 544
  vanilla, 133
  veratrum viride, 94
  Warburg's, 535
Tobacco, tabacum, wild, 505, 507
Toluifera Balsamum, 293
  Pereiræ, 291
Toluol, 70
Tonga, tongine, 91
Tonics, 33
Tormentil, 249
Torreya californica, 184
Touchwood, 59
Tous-les-mois, 125
Toxicodendrol, 365, 366, 367
Toxicology, 18
Tragacanth, 296
Traganthin, 297
Trailing arbutus, 434
Trehala, 444
Triacontan, 432
Tribromo-phenol, 783
Trigonelline, 458
Tri-iodo-meta-cresol, 786
Trimethylamine, 187, 597
Trimethylxanthine, 519
Trional, 779
Triosteum perfoliatum, 347, 522, 542
Tri-oxy-acetophenone, 796
Triticum, triticin, 85, 86
Triticum æstivum (vulgare), 81
Triturati-o, ones, triturations, 21
Trituration elaterin, 551
Troches ammonium, chloride, 304, 667
  catechu, 273
  chalk, 676
  cubeb, 136
  ginger, 127
  glycyrrhiza and opium, 231, 303, 414
  ipecac, 523
  iron, 133, 698
  krameria, 290
  morphine and ipecac, 232, 433, 523
  peppermint, 486
  potassium chlorate, 642
  santonin, 577
  sodium bicarbonate, 184, 655
    santoninate, 577
  tannic acid, 152
Trochisc-us, i, troches, 21
Tropines, 496

Truxilcocaine, truxilline, 320
Trypeta arnicivora, 579
Trypsin, 603
Tsuga canadensis, 74
Tubers, 31
Tulipiferine, 182
Turmeric, 127
Tulip tree, 181
Turnera diffusa (microphylla) var. aphrodisiaca, 392
Turnip, Indian, Swedish, 241
Turpentine, 66
    Canada, Chian, European, Stassburg, Venice, 71, 72
Turpeth mineral, 723
Tutty, tuttia, 709
Twigs, 31

ULMACEÆ, 45, 156
Ulmaria Ulmaria, 143
Ulmus alata, americana, campestris, effusa, fulva, 156, 157
Umbelliferæ, 49, 410
Umbelliferon, 424, 425, 427
Umbellularia californica, 216
Uncaria gambir, 273
Unguent-um, a, ointments, 21
Uragoga Ipecacuanha, acuminata, 520, 524
Ural, Uraline, uralium, 782
Urari, 452
Urceola elastica, esculenta, 349
Urethane, 781
Urginea maritima, 98
Urotropine, 777
Urson, 429, 434, 435
Urtica dioica, 160
Urticaceæ, 160
Ustilagine, 58
Ustilago Maydis, 58
Uva passa, 377
    -ursi, 433

VACCINIUM uliginosum, Vitis Idæa, 434
Vagnera racemosa, 108
Valeriana celtica, dioica, mexicana, officinalis, Phu, toluccana, 542, 543, 545
Valerianaceæ, 50, 542
Vallet's mass, 700
Vallonea, 153
Vanilla Gardneri, guianensis, odorata, phæantha, planifolia, Pompona, 131, 132, 133
Vanillin, 132, 293, 295, 438
Vanillons, 132
Vapors, 22
Venous medication, 25
Veratralbine, 94
Veratramarin, 94
Veratrine, 95, 96
Veratroidine, 92, 93
Veratrum album, officinale, Sabadilla, viride, 92, 94, 95, 543
Verbascum Thapsus, 512, 516
Verdigris, 715
Verine, 96
Vermicelli, 297
Vermicides, 40
Vermifuges, 40
Veronica officinalis, virginica, 508, 509
Vertebrata, 585, 594
Vesicants, 41
Vetivert, vetiveria, 87
Viburnin, 540, 541
Viburnum obovatum, opulus, prunifolium, 540, 541
Villosin, 249
Vinegar, 752
Vinegars, aceta, 19
Vin-um, a, wines, 21
Viola pedata, tricolor, 391, 392
Violaceæ, 391
Violet, bird's foot, blue, 392
Virgin dip, 67
Vitaceæ, 48, 376
Vitellin, 263, 266, 546
Vitellus, 599
Vitis æstivalis, cordifolia, Labrusca, riparia, vinifera, vulpina, 377, 378
Viverra Civetta, Zibetha, 608
Vouacapoua Araroba, 307

WAFERS, 21
Wahoo, 369
Walnut, black, English, 142
Waltheria glomerata, 139
Wars, wurrus, 361
    washing soda, 653
Washrag sponge, 549
Water, 615, 616
    ammonia, stronger, 617, 618
    anise, 414
    avens, 249
    bitter-almond, 264, 265
    camphor, 223
    chlorine, 630
    chloroform, 748
    cinnamon, 220
    creosote, 763
    distilled, 615
    eucalyptus, 406
    fennel, 411, 412
    hydrogen dioxide, 616
    lead, 713
    lime, 672
    melissa, 479
    orange flower, stronger, 334
    peppermint, 486
    rose, 253
    sage, 476
    sambucus, 539
    shamrock, 455
    spearmint, 483
Watermelon seed, 546
Waters, 19
Weed bugle, 484
    loco, rattle, 298
Weights and measures, 838, 839
Whiskey, 741
White arsenic, 730
    cinnamon, 391

- White elm, 156
  - flag, 118
  - hog, 562
  - lead, 710
  - mustard, 238
  - oak, 146
  - of egg, egg-white, 599
  - precipitate, 724
  - sandal, 164
  - snake, 359
  - vitriol, 707
  - wax, 594
- Whortleberry, bog, red, 434
- Wild cherry, potato or jalap, 260, 469
  - horehound, 561
  - sarsaparilla, 407
- Windberry, 434
- Wine antimony, 734
  - aspidosperma, 461
  - coca, 321
  - colchicum root, 111
    - seed, 111
  - ergot, 57
  - ipecac, 523
  - iron, bitter, 535
    - citrate, 696
  - opium, 220, 231, 401
  - pepsin, 604
  - port, 742
  - red, 377, 742
  - rhubarb, 172
  - sherry, 742
  - tobacco, 507
  - white, 377, 742
- Wines, 21
- Wintera aromatica, 181
- Winterberry, 370
- Winterene, 181
- Wintergreen, greenish-flowered, round-leaved, spotted, 430, 431
- Witch-hazel, 242
  - bark, 244
- Wolfsbane, 193
- Wood, guaiacum, 322
  - naphtha, spirit, 776
  - southern, 575
- Woods, 31
- Worm-grass, worm tea, 448
- Wormseed, American, barbary, Indian, levant, 175, 576, 578
- Woorara, 452
- Wormwood, 575

- XANTHIUM canadense, echinatum, spinosum, strumarium, 582
- Xanthopuccine, 187
- Xanthorrhiza apiifolia, 189
- Xanthoxylin(e), 326
- Xanthoxylum americanum, caribæum, Clava-Herculis, elegans, floridanum, pterota, 325, 328
- Xeroform, 788
- Xylol, 70

- YARROW, 570
- Yeast, 58
- Yellow adder's-tongue, 107
  - dip, 67
  - dock, 173
  - jasmine, 445
  - parilla, 206
  - root, 189
  - wash, 726
  - wax, 592, 593
- Yolk of egg, 599

- ZEA, 78
  - Mays, 78, 81
- Zedoary, 128
- Zinc, 705
  - acetate, 709
  - bromide, 705
  - carbonate, impure, 708
    - precipitated, 707
  - chloride, 705
  - iodide, 706
  - oxide, 709
    - impure, 709
  - phosphide, 707
  - sulphate, 707
  - valerianate, 708
- Zingiber Cassumunar, officinale, Zerumbet, Zingiber, 125, 127
- Zingiberaceæ, 45, 121
- Zygophyllaceæ, 47, 322

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